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Vol. XXIII April, 1927 No. 4

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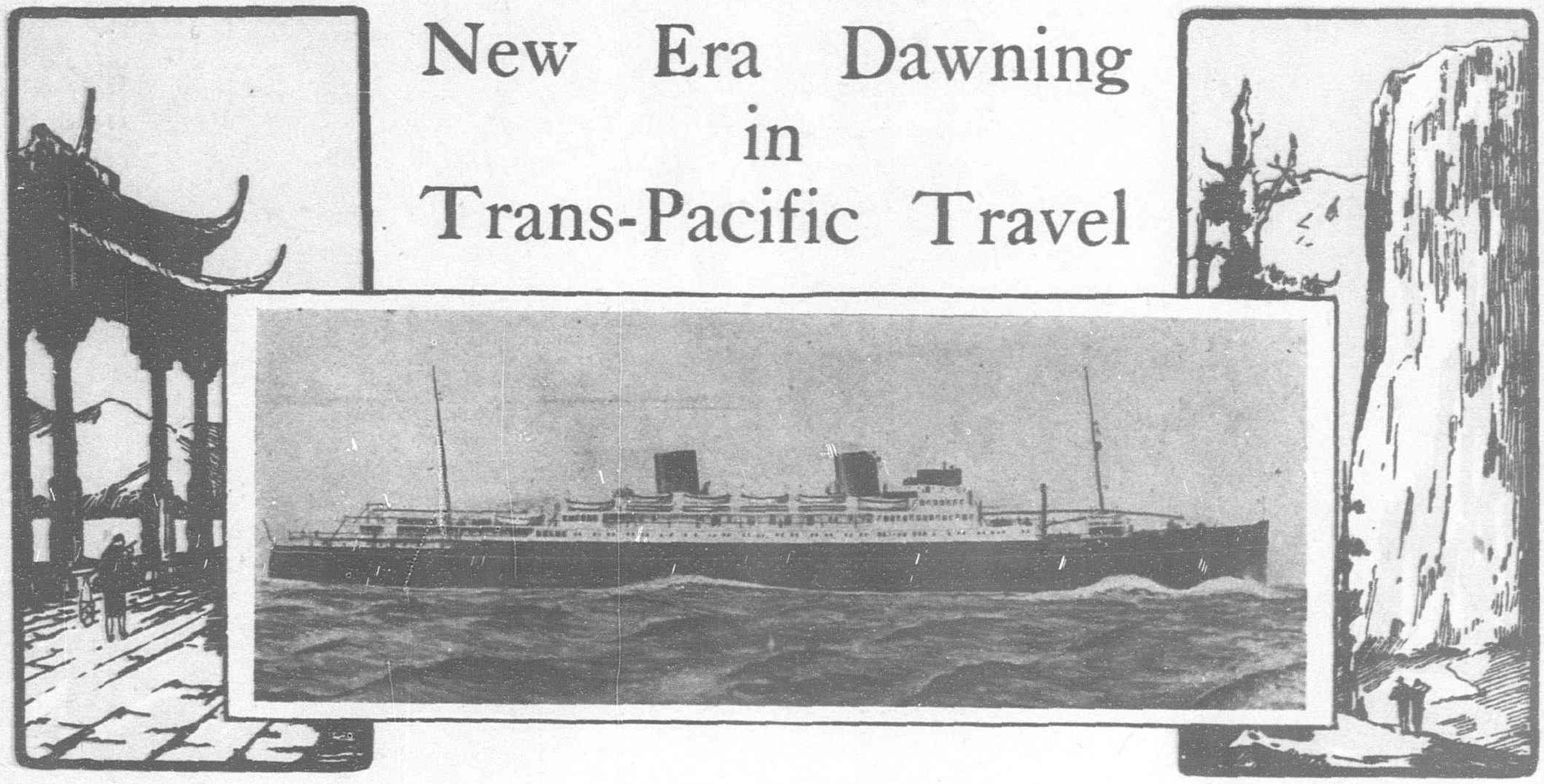

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Fifteen Years of Failure

The Heartbreaking Inability of the Kuomintang to Take Advantage of China's Wonderful Opportunities

The Unforgiveable Error of Excesses

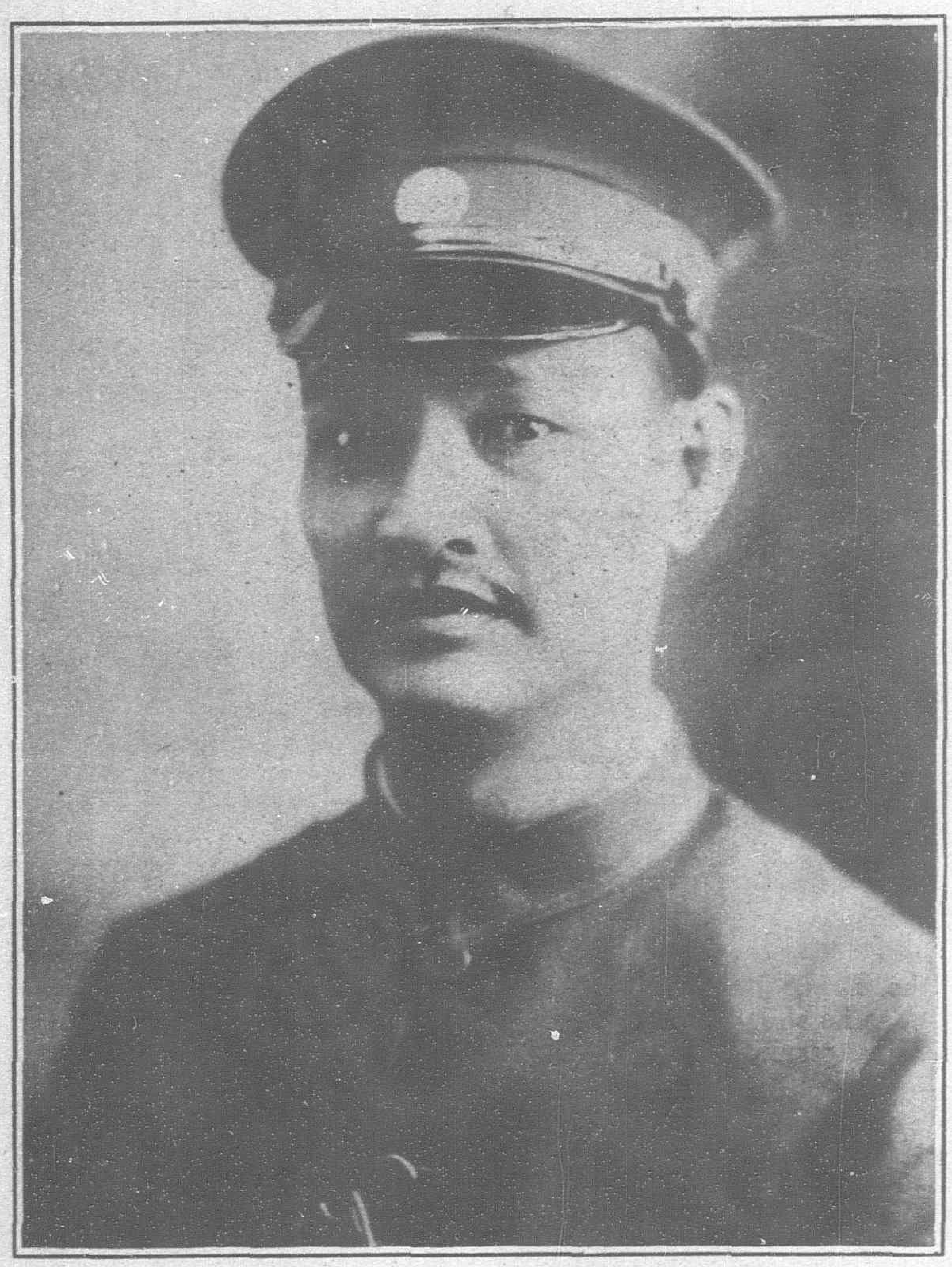
By George E. Sokolsky

TO all friends of China, the Kuomintang held forth the possibility of a revivified, nationalistic China, an equal among nations, an efficient Government for China. The Kuomintang was supported as the only party in China with a definite, coherent program, with the energy to produce effective governmental agencies and with the unity of purpose to overcome the selfish, individualistic tendencies of the feudal warlord and their civilian servants who were keeping China in the chaos of medievalism. On the basis of this idea, on the assumption that the Kuomintang was this only effective modern group in the country, many of their shortcomings were disregarded as the inevitable concomitants of a party and government in the early stages of revolution. Great Britain, among the Great Powers, assumed the leadership in a conciliatory policy toward the Nationalist Government because the British were most vitally affected by the changing situation in China. Japan followed. The United States remained aloof as a Government, but American missionaries in China and the entire American press in China, supported the Nationalist ideal and hoped for a Kuomintang success.

Sun Yat-sen

The British Government consciously, since the Nationalist Government moved to Hankow last December, played into its hands. Mr. Eugene Chen, Minister of Foreign Affairs of the Nationalist Government, brilliant in the use of the English language which gave him an advantageous press in the Home countries, misunderstood the British friendship for fear and weakness. He developed a policy of twitting the British because he believed that they were helpless; he accepted the theory that the British Labor Party would support him no matter what steps he adopted to destroy the British Empire, no matter how his efforts resulted in the wiping out of British trade in China. On the surface, he succeeded for a time. The British sacrificed the British concession in Hankow and gave up a capital investment of one hundred million dollars. The British Government surrendered the concession in Kiukiang. The British Minister in Peking, issued a Note in which his government expressed a willingness to give up all the extraordinary rights of British subjects in China as soon as possible under the condition of the establishment of law and order in the country. When the British concession was seized in Hankow, the British Consul-General would not permit British residents to defend themselves and their property; instead, British women and children were evacuated, the British Volunteer Corps, created for just such an emergency, was disarmed, the British flag was hauled down from the consular flag staff. Such were Britian's turning of the other cheek!

Still, the Hankow Government did not realize what was happening in the world. Day by day, Great Britain was proving its readiness to forego its imperialistic advantages in China and day by day, the Hankow Government was making further demands, committing additional acts of violence against the British. The sympathy of most people, of a very large number of Chinese



Gen. Cheng Chien, Commander of the 6th Nationalist Army

turned toward Great Britain. **The total result of Mr. Eugene Chen's diplomatic efforts was the bringing to China of the largest British military and naval forces ever to have appeared in China.** For it was the British determination that if no other spot in the whole four million square miles of China were safe for a British subject, he would at least have Shanghai as a peaceful spot from which to evacuate his family and his goods.

Japan's Policy of Peace

Japan exceeded Great Britain in a policy of peace toward the Nationalist Government. In the first place, the anti-British boycott of 1925-6 did not affect Japanese individuals or goods. The result was that the Japanese trader and Japanese ships did a thriving business and came into direct contact with the Nationalists, whom in Canton, they found to be efficient, nationalistic, honest, conscientious. Japan as an Asiatic nation could not view with dissatisfaction the efforts of another Asiatic people to achieve recial and international equality. Huge elements in the Japanese masses were pro-Kuomintang, as they regarded this moment as similar to their own Meji Reformation. Many Japanese organizations, political, mercantile, religious sent commissions to China to study the Kuomintang development and they made favorable reports. Finally, Mr. Saburi, Chief of the Treaty Department of the Japanese Foreign Office, a brilliant diplomatist, visited China, studied the Nationalist Movement in its early stages in Hankow and its greater maturity in Canton and made a favorable report. Apparently he desired that his Government should support the Nationalist Movement.

In charge of Japan's foreign policy throughout this period was Baron Shidehara, the man who in many ways is responsible for "Japan's change of policy toward China." This change of policy is of historical significance, for it is the outstanding constructive result of the Washington Conference. By it Japan announced to China and the world, that the policy of aggression and aggrandisement, the policy which produced the Twenty-One Demands, the policy of supporting one Chinese militarist against another, was an error of historical judgment; that henceforth the Japanese people would show the utmost friendship and sympathy for the Chinese people in their efforts toward constructive reform and international equality. And as the only political party in China which was frankly, effectively striving for these goals was the Kuomintang, the Japanese Government, in spite of their huge economic interests in the Yangtze Valley, part of which was controlled by Marshal Sun Chuan-fang, and their economic and political interests in Manchuria, all of which was controlled by Marshal Chang Tso-lin—Japan, in spite of these considerations, showed every sympathy toward the Nationalist Government.

Again, Mr. Chen misunderstood the Japanese attitude. He could not believe that Japan was sincere. He could not understand that Japan hoped to win the good-will and friendship of the Chinese people. He attributed Japan's proffers of friendship to weakness, to internal economic troubles in Japan, to the strength of the Communist Party in Japan. He played upon these weaknesses. He sought to separate Japan from Great Britian, to utilize Japan in the game of isolating Great Britain. He might perhaps even have succeeded, for Japan had had unfortunate experiences with the European nations. Four times, Japanese blood has been spilt and Japanese treasure expended on the Asiatic mainland, only to be wasted profligately by European diplomacy which robbed Japan of any fair return for her effort. The China-Japanese War, the Russo-Japanese War, the Shantung Expedition during the Great War and the Siberian Campaign are too well remembered in Japan for the Japanese masses easily to approve of further expenditures of

Gen. Tang Seng-chi, Commander of the Nationalist Army in Hankow men and money in joint enterprises on the Asiatic mainland. Mr. Chen knew of this feeling in Japan. He used it in his diplomatic adventures.

But Mr. Eugene Chen is not a powerful factor in his own Government. He is a brilliant and conscientious foreign minister, but in the politics of his Government and in the decisions of his party, he plays an exceedingly minor role. The men who dominated his Government, Mr. Michael Borodin of Soviet Russia, Mr. George Hsu Chien, Minister of Justice and an outstanding Chinese Communist and Mr. Teng Jan-dah, a leader in the labor and peasant movement of China, were managing the political stage without reference to Mr. Chen's promises and understandings. In Shanghai, the Japanese found that their textile industry was the first to be attacked, that no matter what concessions they made to labor, no matter how they strove to meet conditions fairly, they were made to suffer huge economic losses and to appear as capitalistic oppressors of labor under the organized campaign against them by the Communist Party of China and the known agents of the Nationalist Government in Shanghai.

Finally, the Nanking outrage occurred and Japanese men and women suffered as much as did Britons and Americans. The Japanese consulate was evacuated and Japanese were killed. Japanese women were shamed. No consideration was shown for racial affinity at Nanking. No question of Asia for the Asiatics appeared there. The Japanese were foreigners and they must suffer as all foreigners suffered. Every Japanese was evacuated from Nanking.

Then one of those accidents occurred which wiped out all considerations of friendship between the Japanese and the Hankow Government. A Japanese and a rickshaman in Hankow got into an altercation over a matter of trivial importance. Soon the Japanese Concession in Hankow was attacked by a mob and for a moment, it looked as though the Japanese would share the fate of the British. But the Japanese Consul-General in Hankow and the officers of the Japanese Navy were not going to be driven out of their property—a concession which the Japanese would have been pleased to rendite to China by negotiation and consultation but which they could not give up under duress. Japan then was forced to defend herself in Hankow. All Japanese who were not needed for defensive purposes were evacuated from the Yangtze Valley. Several thousand Japanese men and women returned to Nippon to tell their harrowing tale to their own people. Japanese marines were landed in Shanghai and took part of the line of defence of the International Settlement. Japan was in the struggle on the side of the British. *The Nationalist Government lost a friend and a possible ally.*

The American Missionary's Reward

Beyond all other groups of foreigners, the American missionary has been sympathetic toward the aspirations of the Kuomintang. It was not so much the Chinese propagandist who gave the Kuomintang an excellent press in the United States, but rather the American missionary whose reports told of the genuine nationalism, the ability of the personnel, the forward-looking views of the Kuomintang leaders with whom they came in constant contact. The American missionary lacks altogether imperialistic ambitions. He has regarded himself as a servant of China and the Chinese. He has been willing to take a secondary place in the councils of the Christians in China if the Chinese would accept the first place. He has, more than any other foreigners, prepared for his Chinese successors. In the National Christian Council, which is predominantly Chinese and American, the principal officers are Chinese. In the Y.M.C.A., the principal officers have for a long time been Chinese. In American colleges, Chinese vice-presidents were being trained to step into the chairs of the American presidents. Some American missionaries went to the extent of voluntarily giving up the right of extraterritoriality. Most of them were in favor of their Government revising and altering existing treaties between China and the United States. The mission boards in the United States were the main arteries for the dissemination of news favorable to China and particularly to the Kuomintang.

Yet, step by step, the American missionary has been driven out of Nationalist territory, his schools and hospitals and churches were seized, not always by Chinese Christians, sometimes by Communists, sometimes by atheists, sometimes by soldiers who quartered their horses where students used to study. As the American missionaries were being evacuated under Government orders from stations where they had labored for years, they still had faith in the Chinese and the Nationalist Movement, they still found excuses for the excesses, they still blamed much of their failure upon themselves. Then occurred Nanking.

There was no mistaking what happened at Nanking. The missionaries were driven out by Nationalist soldiers. There are ample affidavits to prove that the soldiers shaming the Americans were Hunanese regulars of the 6th Nationalist Army under the command of General Chen Chien. A missionary has sworn that he personally spoke to General Chen Chien, who said that now was no time to discuss treaties but that the foreigners had to be shoved out in this way. (He then made a motion with his hand, indicating pushing people out forcibly, shovelling them out.) Dr. J. E. Williams, President of Nanking University, a man whose thirty years of friendship and service to China are a monument for his tomb, whose university has ever been the friend and servitor of the Chinese farmer, whose cotton it had saved and whose wheat it had improved, was mercilessly shot by a soldier to whom he spoke kindly.

Every American missionary in the Yangtze Valley, with a few exceptions in Szechuan, was evacuated from the country by the American Government. Millions of dollars of American missionary property, not used for investment, but schools, universities, libraries, laboratories, agricultural stations, hospitals, churches, dwellings were left standing as they were, fully equipped to be seized and held by whosoever wished or could take them over. Many of the Chinese Christians were heroic

Teng Jan-dah, Chief of the Political Bureau of the Hankow Government in Nanking; but there is also the other side of the picture—treachery, ingratitude, forgetfulness. **The American missionary no longer can honestly defend the Nationalist Government. He has been repudiated by the Nationalist Government. He has been thrown out of China by the Nationalist Government.**

Who's Is the Blame?

The Kuomintang under the leadership of Dr. Sun Yat-sen, was a genuine nationalistic organ. It was serving China. It was not concerned with doctrines which were extraneous to China. But in 1923, Dr. Sun made the tremendous error of his life when he permitted members of the Communist Party of China to join the Kuomintang as individual members. By that act, Dr. Sun paved the way for the eventual seizure of the party by the Communists. Previous to taking this step he had already associated with himself, certain Russians in an advisory capacity. The leader of this Russian group of advisors was Michael Borodin, who has since become world-renowned as the dictator of the Hankow Government. As long as Dr. Sun Yat-sen was alive, Mr. Borodin and the Communists were quiescent, devoting themselves to secret, intensive organization work and little by little, largely through personal pursuasion, they won over to their cause or gained the personal friendship and admiration of the principal leaders of the Kuomintang party. It was not until Dr. Sun Yat-sen's death that the quarrel between the Communists and Kuomintang members came into the open. One by one, the historical leaders of the party were intrigued into serious errors by the Communists, were made witlessly to fall into Communist traps, were helped to their down-fall. Some were assassinated, some were exiled to Moscow, others retired from public life and took up residence in Shanghai, Hongkong and other safe places. The party lost the value of trusted and experienced leaders, of Chinese men of importance. It became a party of "new" men under foreign guidance. And the guidance became Russian. The new men who forged to the top, were usually Communists, men who had won their political spurs not in the service of China but in the service of the Third International. These men were not devoting their party to the constructive development of their country but to the preparation of it as a spring-board for a world revolution. They are the producers of the chaos.

The Price China Must Pay

China, at this moment, then finds herself faced with the fact that instead of having taken advantage of the wonderful diplomatic gains which had been made during the Washington Conference, she is now back two decades, in the worst stages of Boxerism, when men and women dare not dwell in the interior of the country, when life and property is nowhere safe, but with this difference, that huge, improperly organized, irresponsibly led armies are marching to and fro through the country, looting, shooting wildly, involving China in international complications. And when a Government, a foreign Government, seeks the Chinese Government to deal with it, to hold it responsible, what do they find?

In Peking, there is a Government which is headed by Dr. Wellington Koo and which is supposed to represent the authority of Marshal Chang Tso-lin. This Government controls some parts of north China, but other places in north China are under the more or less independent satraps, Yen Shih-shan of Shansi, Wu Pei-fu of part of Honan and Feng Yu-hsiang of the northwestern Provinces of Kansu, Sinkiang and Shensi as well as those parts of Mongolia which the Russians have not made into a Soviet Republic.

In Hankow is a Government which is at present in control of Hunan, Hupeh and Kiangsi but which contains an uncertain element in the personality of General Tang Seng-chi, who commands the largest army in the nominal control of the Government.

In Nanking is a Government organized by General Chiang Kai-shek, which has the certain control of southern Kiangsu and the province of Chekiang. Anhui is very uncertain and northern Kiangsu is in the hands of Marshal Sun Chuan-fang. Kwangtung, Kwangsi, Fukien, Kweichow and Yunnan are loosely united to this government, which is in the process of organization at the moment of writing this article.

So, China finds herself again divided into many parts. Instead of the great Kuomintang victory of last Summer bringing unity, at least to South China, it has brought further division and confusion. Instead of the Nationalist Government consolidating its power in the provinces which it conquered, it involved those provinces in the world revolutionary movement, broke down the economic structure, disturbed the social organization and produced chaos. Instead of giving itself a breathing spell to effect reorganization, the Nationalist Government attacked the foreign powers, sought a quick route to the solution of all international problems concerning China and ended in what must be an undeclared war between China and the Powers.

The failure is tragic. Dr. Sun Yat-sen would never have tolerated such deadly leadership. He would have driven the Hankow personalities into the Yangtze for their stupidity and perfidy. They have now had their day—and China will be required to pay in men and treasure.

The Inevitability of a Far Eastern War

The Russians Have Nothing to Lose: They use the Chinese and other Asiatic Peoples to attack Great Britain, The United States and Japan

The Cost to China

By George E. Sokolsky, Associate Editor of the Far Eastern Review

FOR a moment, the war between the Nationalist armies and the Ankuochun, the barter for place among contending generals, the transference of allegiance from one affiliation to another, the return of the south to tuchunism, are not of as much importance as the imminence of war between Soviet Russia and Great Britain. This idea is naturally pooh-poohed on all sides; yet the fact remains that the cords are constantly being drawn more tightly, the issues are becoming more clear and Soviet Russia is inevitably being forced into a corner whence it must either fight for freedom to follow its established procedure of destroying potential enemies from within or throwing such a policy overboard and becoming an orthodox state among states.

Soviet Russia is the Cain among nations. Every hand is against her and her hand is against everyone. With a nervousness which arises from an inferiority complex, with a desperation which comes from ostracism, Soviet Russia has forged new weapons of attacking states, weapons which affect a state as germs affect individuals. Disintegration sets in. Chaos becomes a chronic condition. Trade and industry cease. Labor troubles are everyday occurrences. And these phenomena are not so much the results of the activities of Russian agents as of indigenous, native sons trained in Russia or financed by Soviet funds, functioning under the general direction of a Russian advisor. There is hardly a country where this method has not been attempted, usually only to end in complete failure, for even the agents of Soviet policy eventually realize that they are destroying their homeland in the interest of a foreign nation; even those who have become converts to Communism realize that they must preserve the integrity of their own land.

The Sparticist Movement in Germany failed ; Bela Kun's Movement in Hungary failed ; Mr. Cook failed in Britain ; the Communists never got a foothold in the United States ; Fascisimo dominates Italy and so the tale goes. In Turkey for a time, the Communists assisted Kemal Pasha, but when he had used them to accomplish his purposes, he threw them out of the land and arrested every Communist agent whom he had himself found so useful when he was climbing to his dictatorship.

China was one of the last countries Soviet Russia attempted to use in this way. The soil was not particularly fruitful. China is largely a peasant land of small holding held communistically by those who work the soil. Industrial laborers are few in number, hardly one per cent. of the whole population, and influence public opinion to a very small degree. The first Soviet agents who came to China were discouraged by the work here ; the best they could do was to send a few students to Moscow and Irkutsk to study the Russian language and to become accustomed to revolutionary language and technique. The Rosta News Agency found it difficult to get its news published in the Chinese press. The Kuomintang, which, in Communistic parlance, is a party of the nationalistic bourgeoisie, is in every principle opposed to Communism and to the general methods and policies of Soviet Russia. The various provincial military leaders were utilizing the state for the upbuilding and maintainence of a feudal family fortune and therefore were not interested in the doctrines of the soviet agent. From 1920 to 1923, Soviet agents were being changed in China every few months, because no one seemed to find a foothold for work.

Borodin's Part

Mr. Borodin was the first Soviet agent who conceived a method of working in China effectively. He offered his services to Dr. Sun and served him faithfully and loyally, never while the doctor lived forwarding the cause of the Communists, even apparently opposing for a time, the communist party of China. Perhaps no man counselled moderation, in those days, more often than Mr. Borodin. He gained a reputation as an unselfish and capable adviser and his plan for the reorganization of the Kuomintang as a political party and the adaption of the Commission form of Government for the Government which the Kuomintang dominated was accepted with great enthusiasm. Even when the Communist Party of China offered to join the Kuomintang as individual members, they were admitted, Dr. Sun and the other Kuomintang members never suspecting that this was the first step toward the conquest of the Kuomintang by the communists, who in time were to gain control of the party machinery. For, after the party had been reorganized by Mr. Borodin, he alone in China understood fully the working of the system he had devised and he alone could put into key positions in the party such Chinese as were already pledged to follow his leadership, either through personal affiliations or because they were already members of the Communist Party of China.

Communist Successes

The work of the Russians within the Kuomintang from 1924 to the present day has been stupendous. They have achieved more, from their standpoint, in a matter of three years than the missionaries have in centuries. They have not only been able to organize an active, effective and loyal body of co-workers but they have overcome popular opposition to a foreign system and have succeeded in hammering even old-fashioned Chinese into a unit which can do and does the Russian's bidding at all times. The fact must be borne in mind that no matter how we may dislike Soviet Russia and the Russian tactics, Borodin has succeeded where the American missionary and the Japanese political agent has failed.

Russia has succeeded much for the same reason that Mussolini has succeeded in Italy. They use the weapons of intimidation and force ; they direct and control all the agencies of government and of party machinery and they give no opportunity of democratic expression. As long as Dr. Sun Yat-sen lived, the Kuomintang was a democratic organization. Since, Borodin has become the master of the Kuomintang, it has become an autocratic organization, in which the power is held by a small group of Communists who serve on all commissions and who check those agents of the government who may not be altogether loyal although their services are accepted because they are necessary to success. When their services are not necessary, when Communists have been trained to do their work, they are discarded unmercifully. That explains why such men as Hu Han-ming, Dr. C. C. Wu and Chang Chi are no longer members of the government. They are no longer necessary. Other men have been found to do the work upon whom the central group of communists, the pivot of which is Mr. Borodin, can depend with a greater sense of security.

Another factor in favor of the Communist success is their complete understanding of Chinese psychology and their willingness to meet the situation not upon a preconceived western bias as the missionaries have done, or a preconceived eastern bias, as some Japanese, but realistical as the facts develop. They know all about Chinese jealousies and they play upon them. Adopting as a method of procedure the policy of "join and divide," they have been able to split up the Kuomintang into factions, until to-day, a small group of men not more than a dozen, dominate the party, control its machinery and are able, by avoiding among themselves the jealousies and personalities usual with Orientals, to achieve a solidarity of purpose, altogether unknown elsewhere in Chinese affairs.

It is a question then not so much as to what the whole body of the Kuomintang seeks as what this dominant, powerful group will do. But before that is discussed, the fact must be brought out that opposite this group, no longer politically allied to it, are these military men, who have fought the Kuomintang's battles amid great hardship and who, after all, have still to do the fighting if China is to be united under the Kuomintang. The leader of this group is General Chiang Kai-shek, Commander-in-Chief of the Kuominchun. Following closely at his heels in leadership is General Tang Seng-chi, not at all a Kuomintang leader, but one of the coopted militarists, who has been developed by the Communists to counteract the stardom of General Chiang Kai-shek. These military men are still more or less tuchunish. They have come largely under the revolutionary influence of the Kuomintang, and they are therefore different, pertinently different from Chinese militarists, but they have not been able to divorce themselves entirely from the average Chinese military man's conception of the state as something which belongs to him if he can hold it with soldiers. The weakest link in the Soviet chain are these military men, for not only will they not submit to the Bolshevik program for a disrupted China, but they prefer to develop a China in which they, as military men, play a great and effective part. The Communist nucleus places these men in a circle surrounded by C. P. committeemen, who counter their actions when such actions savour of Napoleonism. These C. P. committeemen make it difficult for a general to engage in separate negotiations and to conduct within the Kuomintang the same treasonable bargainings as are usual in other political groups.

It is this power of controlling individual actions, of concentrating all authority within the committees and placing on each committee enough C. P. members or supporters to give them control, which makes it possible for the Communist nucleus to intimidate and master officials of the Nationalist Government, even when those officials are normally antagonistic to everything the Russians do.

It is not true to suggest that this Communist nucleus is united as to purposes. Many Chinese in it are genuinely nationalistic, are patriotic and hope to see China a great power among nations. Others are imbued with the ideas of the world revolution, which they hope to achieve with China as a spring board. The Russians in the group are divided between Russian imperialists, who envisage the prospects of a friendly, perhaps allied China, should Russia be attacked by or attack any of the imperialist powers. Other Russians are world revolutionists who believe that when China has become Communistic, the ball will start rolling. Java, the Malay States and Japan will find themselves centers of revolutionary activity and ultimately India—which to the Communists means the eventual destruction of the British Empire and the removing of the center of world influence from London to Moscow.

The Attack on Britain

It was for this reason that Great Britain rather than any other Power was singled out by the Kuomintang. To them Britain is the keystone of the European system of politics. Destroy Great Britain and all the European imperialists fall together with Japan and the United States. In their place will be an alliance of Eurasian powers, China, Turkey. Afghanistan and at the apex, Soviet Russia. This grandiose ambition may be the result of sheer radical idealism, of thinking in terms of unrealistic political concepts, of ignoring the self-defensive capabilities of other peoples, of refusing to acknowledge the power of economic determination of political action, which is the very creed of the Communism they advocate. Or, it may be a revival of the slavic imperialism of Peter the Great and Catherine II, an imperialism as malevolent a Napoleonism, in the ideology of which one nation sets up a hegmony for the entire world. Which ever it may be, the effect is the same: under the tutelage of Soviet Russia a party has been created in China which has sufficient force in less than a year to conquer half of China—all the land south of the Yangtze Valley and which has achieved in its negotiations with foreign Powers a return of two concessions. Similarly, this force has organized the labor and peasantry in the territory under its control and is striking at all the foundations of Chinese civilization, Confucianism, the family system, the position of woman, the educational system—practically without resistance. Old-fashioned Chinese, conservative bankers and merchants, scholars in Shanghai, previous to the coming of the nationalists, but with full knowledge of events in Hankow, prepared to welcome the nationalists with joy and enthusiasm. Since General Chiang Kai-shek has arrived in Kiangsu, the Chinese bankers have voluntarily lent him three million dollars and are now making arrangements to lend him a similar sum. These are facts not to be ignored.

Were the international relations involved in this new dispensation in China only a question of the independence of China, the return of full sovereignty, the chance of doing business under a less efficient, less experienced Chinese regime, it is almost certain that none of the principal powers, surely not Great Britain, the United States and Japan would oppose Chinese nationalism. In fact, the propects of a powerful force effecting unity and order in China would be welcomed. It is the Russian factor that complicates the problem. If Russia is to dominate China and is to use China as a spring-board for world revolution then all the powers are deeply concerned and all imperialist powers, that is the United States, Great Britain, Japan, France, Holland, Belgium, Italy and Portugal must fight for their national existences. They will ultimately have to fight Russia—they will certainly attack China first.

The Soviets are attacking Great Britain, not only in China, but in Java and Singapore. Java and the Malay States are so closely related economically that it is impossible to disassociate them. Probably, the greatest fortunes in this area are Chinese fortunes, great wealth accumulated by Chinese immigrants from Kuangtung and Fukien, who started often as coolies and ended as millionaires. Much of the skilled labor in these countries is done by Chinese coolies from the two southern provinces. All these Chinese, rich and poor, are supporters of the Kuomintang on a nationalist basis. They do not and will not believe the Kuomintang affiliation with Soviet Russia. All statements to that effect are regarded as imperialist propaganda. They have become convinced that if they break the power of Great Britain, China will become an equal with all nations on the face of the earth and that Asia will become the full equal if not the superior of Europe. They still provide funds for Kuomintang activity and in Java and Singapore, they lend themselves as tools of Soviet agents. Little news of these movements have appeared in the press but they have had more to do with the sending of the British Defence Forces to China than even the necessity of defending Shanghai.

Britain's Alternatives

In the present situation there are not many alternatives for Great Britain:

1. Great Britain may altogether evacuate China, surrender the billions of investments and sacifice the prestige of the Empire in Asia;

2. Britain may alone attack South China in the interests of North China;

3. The foreign powers may support some group within the Nationalists to drive out the Russians;

4. Britain in combination with other powers may make war on China and Russia.

If the case is simplified to the alternatives suggested above, it will be seen that the first two suggestions rule themselves out as impossibilities. The first means the ultimate destruction of the British Empire; the second is destined to failure because there is no trustworthy group in the North; the third is a genuine possibility but entails definite sacrifices as no group within the Kuomintang can function upon any program which does not have as its minimum Dr. Sun Yat-sen's "Three Principles." The British and Japanese programs of conceding to Nationalist demands are to a very large extent in harmony with the "Three Principles," in which there is nothing which is not opposed to Communism and the Soviet dictatorship in China. The question, however, arises, can any group within the Kuomintang gain enough force and cohesion to break the control of the Soviet agents, Chinese and foreign, over their party. This question only time can answer: at present, Generals Chiang Kai-shek is making a decided effort to destroy the Russian influence in the party, but whereas, among the Communists, a discipline have been developed which transcends personal jealousies, the military men still are affected by tuchunism, by the instinct for feudal territorial possession, which naturally leads to personal differences.

An Inevitable Alliance

The fourth alternative is the most likely. Great Britain alone, or Great Britain and Japan, or a group of powers will ally to war on Soviet Russia and China. In such a contingency, the occupation of China by foreign forces is a simple matter. There are so few modern means of communications that the possession of the treaty ports and control of the railroads by the Powers would give them practical control of the country except the vast regions of Mongolia, Turkestan and Szechuan. Great Britain could easily dominate Szechuan through Thibet on the one hand and economically, by control of the Yangtze Ports to Chungking. All the principal rivers of China, with the exception of the Yellow River, could be patrolled by gunboats, which could effectively overwhelm most of the cities along these rivers. The army of China, even the Nationalist Army, is a neglible factor and could easily be disarmed. As most of the soldiers would become bandits, this might lead to a very serious problem; therefore, certain forces could be organized as a constabulary under foreign officers. China could only resist such warfare by the use of the economic weapon. There would probably be a nation-wide boycott of foreign goods and a refusal of labor for foreign-owned industries. It is still difficult to estimate the full possibilities of the general strike and the anti-foreign boycott in China; American, Japanese and British trade have, at times, suffered severely from the boycott and industry in China is now fairly crippled because of political labor troubles. The most pertinent deterrent to intervention has been the huge losses to the intervenors from the boycott and the general strike. But these deterrents are being removed by the actual existence of the boycott and the general strike previous to intervention. In all territory now held by the Nationalists, Great Britain and latterly Japan are being boycotted. The British and Japanese mills and factories in Hankow and Shanghai have practically been forced to close their doors for such long periods that it would now be financially more profitable to keep them closed until the political strikes cease. The economic deterrent ceases to operate when profits cease and when the value of the property decreases from the political opposition to its existence.

The co-operation of Great Britain and Japan in such a war is essential to its success. Japan would occupy Manchuria, Shantung and Fukien and the Primorsk Provinces of Siberia. The Japanese navy would guard the Yellow Sea. Just as Britain from Thibet would penetrate Szechuan and possibly Kansu, so Japan would seek to penetrate Mongolia and to close the Urga pass. The complete separation of China from Russia would be the objective of all military and political enterprises in China.

France would naturally support Great Britain and Japan, as the Japanese position in Annam would be seriously imperilled in the event of a Communist China. France would close Chinese egress southward and would undoubtedly dominate Yunnan, Kweichow and Kuangsi.

The role of the United States would be most significant. The principal deterrent to American action in China has been the presence and importance of American Christian Missionaries in China. This deterrent has been removed by the nationalist who have everywhere driven American missionaries out of the territory they entered. The United States then no longer has a sentimental interest in impeding the military intervention. On the other hand, all the Powers involved in such a war against Russia and China are debtors to the United States, while China's debt is insignificant and Russia's debt is practically lost. To sacrifice such good customers as Japan, Britain, France and Holland for such doubtful customers as China and Russia would not be good business. Furthermore, American popular antipathy to Bolshevism will stimulate public opinion favorable to this enterprise, but the United States will always insist upon the territorial integrity of China, which it may become difficult to maintain in the face of a world war. American financial if not military support, may be expected.

The "Far Eastern Review" has always opposed and opposes to-day, foreign military intervention in China, but the fact remains that Soviet Russia has been leading China to a position which makes such intervention but a phase of the war on Russia.

The Soviet's Alternatives

The question is what would Soviet Russia do? Again, it is a matter of alternatives:

1. Get out of China before the war involves her.
2. Seek to form an Asiatic coalition against the Powers with a special view toward striking at India through a Persia-Afghan-Soviet coalition.
3. Fight alone a defensive war with a view to involving the Powers in as expensive an enterprise as possible.
4. Foment social and political revolutions in the enemies country.

It is almost clear from Soviet conduct in Persia and Turkey that in the event the game becomes too hot, Soviet Russia will abandon all her activities in China. On the other hand, as long as the Powers continue to regard Soviet Russia as a pariah, the Soviets will continue to foment revolutions through the Third International. Here is a vicious circle through which no one seems to be able to break. There is so much sheer fanaticism still in Soviet Russia, so many men who are products of revolution, that it is difficult, even in the face of the various changes of economic policy, to achieve a change of view by or toward Soviet Russia. Efforts on the part of the Third International to foment revolutions have thus far failed everywhere except in Turkey, Persia and China. Efforts to organize and maintain Communist organizations in European and Asiatic countries have not been such utter failures. The attempt to organize an Asiatic League of Nations has completely failed because of Japan's opposition. Yet, Russia does not regard herself as defeated. What plans she has to counter the almost certain cohesion of the imperialist powers are problematical. From the fact that all Soviet propaganda seems to follow the classical lines of fomenting international jealousies, of playing one imperialistic power against the other, it would seem to indicate that Soviet Russia is still adhering to the old idea that the powers cannot work together. If that is the Soviet idea, Soviet Russia is doomed in China, for the Powers can, when driven to extremities, coalesce, particularly when trade has been so completely disorganized as to eliminate all causes of economic jealousy.

There is this one idea which, finally, strengthens the Soviet position. Soviet Russia has nothing to lose but her energy and a few dollars spent in propaganda and in support of the Kuomintang. There is practically no Russian trade in China; there are no Russian industries; there is no Russian shipping except for the Nationalist Government. Even if the Powers make war on Russia, the battles will be fought in China and China will suffer the principal losses. Soviet Russia then can afford to gamble with China's future. Her own is hardly involved.

The Economic Crisis in Japan

AS this issue of the *Far Eastern Review* goes to press, the world is startled by the economic crisis in Japan. Large and world-renowned firms and banks have either gone into bankruptcy or have suspended business. A moratorium for twenty days has been ordered by the Japanese Government. It is too early to comment upon these circumstances fully, but the causes of the financial crisis may be stated.

At the end of the war boom period, when the world-wide slump affected all nations, Japan did not, as some other countries did, write off their losses, take the water out of their balance sheets and start on a new basis. Japan, then, has for several years been carrying the heavy burden of war-time inflation. This inflation had to disappear from Japanese economic life before normal financial conditions could be resumed. It is perhaps unfortunate that Japan did not deflate its economic system as soon as the United States did, but there were many causes not the least important being, the great earthquake of 1923, which involved Japan in such a huge expenditure of life and treasure that there were few leaders who were willing to risk a further disturbance of conditions.

Japan would perhaps have been able to readjust without disturbing its economic system were it not for the huge losses which Japanese firms and individuals must have suffered by the stopping of the China trade. One can hardly realize what it has meant to Japan to be forced to evacuate its nationals from the Yangtze Valley, to close the offices of the firms and banks, to give up its main foreign trade centers. This was not the result of an anti-Japanese movement, of a Chinese popular antagonism to Japan. It was the definite result of the activities of Soviet Russia and the Communist Party of China, which is bitterly anti-foreign and which hopes to bring about a revolution in Japan by throwing thousands of Japanese out of work who are employed manufacturing goods sold in China.

The whole world will sympathize with the plucky Japanese in their present crisis. Japan has proved what an oriental nation can accomplish with western tools and after all, all countries have gone through panics and periods of economic dissability. The Seiyukai Party has come into power for the purpose of saving this situation and they have squarely and bravely met the issue and have openly declared a moratorium, so that there is no longer a question of "face" but of meeting every phase of the situation squarely. There can be no question that Japan will find a way out of this difficulty and will win in the end. For a conscientious, hard-working, straightforward people are bound to win. And in this catastrophe as always in her difficulties, Japan will have the good-will and full support of the United States.

Japanese Investment Houses Open Offices in New York

FOLLOWING shortly after the organization of a Japanese-American investment trust to handle Japanese hydro-electric securities, comes the further encouraging announcement that two of Japan's most powerful investment and brokerage firms will open offices in Wall Street. These two firms are Takehara & Company and Nomura & Company, both of Osaka. The first firm has already opened temporary offices in New York and two representatives of the latter firm have since arrived for the same purpose. Both firms have established high reputations in Japan for their conservatism and number among their clients many of the richest capitalists and corporations of that country.

Mr. Takehara, one of the most powerful operators on the Osaka Stock Exchange, fought against the recent attempt of that body to shorten the term of delivery from the period of three months, contending that to do so, would make it impossible for American bankers to deal in Japanese securities. So interested has Mr. Takehara been in international finance, that on the occasion of the sixteenth birthday of his firm he set aside a large sum for the purpose of educating the younger members of the organization in world finance.

It is understood that Mr. Takehara contemplated opening an office in London but decided against it in favor of New York in the belief that this city will become the hub of world financing. He came to New York last fall to investigate the Stock Exchange system and it was soon after his departure that the announcement was made that the Stock Exchange would become an international market through the listing of foreign common stocks. It is believed that this action had great influence in the decision of the Japanese firms to open offices in Wall Street, the first strictly foreign investment houses to open in New York.

Although it is anticipated that considerable American money will be invested in Japanese shares and securities as a result of this intimate connection with the world's financial centre, it is also probable that Japanese funds may be invested in American securities and by retaining them in New York, build up an extensive Japanese credit in this country.

Americanization of Oriental Department Stores

A few months ago, Mr. Kurashi Kitadi, general manager of the Mitsukoshi Department Stores of Tokyo, completed an exhaustive study of American department stores and retailing methods and now Mr. Li Sing-kui a leading banker and merchant of China, is touring the country gathering data with the object of establishing a chain of 5, 10 and 15 cent stores in China, Mr. Li says there is a great need for small commodity and retail shops in China, where the American idea has not yet been introduced.

In an interview with Mr. Kitadi, he said ; " The Mitsukoshi, Ltd., which operates six stores in Japan, including one in Tokyo that employes 6,000 persons, has recognized the trend of the Japanese toward Anglo-Saxon products and ideas. Japanese men and women are getting away from the native garment and showing a preference for styles worn in the British Isles and America. While Japanese men are displaying a taste for the English fabrics and American tailoring, the women of that country demand the fine lingerie and stockings made here.

While Mr. Kitadi expressed his optimism over the enthusiasm that the introduction of Anglo-Saxon apparel ideas was meeting with in Japan, he called attention to the high tax the Japanese Government imposes on all dry goods, saying that this would prove an obstacle.

The United States was the last stop in a world business tour which Mr. Kitadi took in the interests of his firm. Before embarking at Bremen, he spent several weeks in the Continental countries, buying occidental merchandise which he thought would appeal to the Japanese consuming public. He spent two weeks in New York and then toured the United States and Canada. He was specially interested in American department store advertising methods. He said the Japanese department stores were gaining an increasing appreciation of the value of advertising and were putting more and more money into these channels.

Mr. Li Sing-kui says that the Chinese can not get enough of American chewing-gum and candy a statement which seems to be borne out by the fact that two shiploads of American sweets are now on their way to that country with more to follow.

America's Vindication

THE United States Supreme Court has handed down its decision in the celebrated case involving the Elk Hills naval oil lease and the pearl harbor storage contract. The leases were declared invalid because they were obtained by fraud and corruption. Neither the navy or the interior department were authorized to buy oil fuel depots at pearl harbor or elsewhere by trading the navy's crude oil reserves off for them. So flagrant was the illegality of the pearl harbor contract that Doheny's companies are debarred from any right to be paid the $10,000,000 spent by them in building the storage depot.

Fall and Admiral Robinson, declared Justice Butler, conspired to give Doheny's companies the contracts. This fact is clearly proven by tracing the correspondence between the pair and Doheny. Irrespective of whether the $100,000 loan from Doheny to Fall was a bribe or not, Fall's whole action was fraudulent and the navy department's agreement to have Doheny build the pearl harbor tanks in exchange for royalty oil, was illegal. Congress had made no provision for its construction. No appropriation was made or authorization given. Consequently, the petitioners stand as wrong-doers and cannot seek repayment of expenditures for unauthorized improvements. The decision of the Supreme Court is final. There can be no appeal.

Every right-minded American citizen will rejoice in a verdict which vindicates the honor and good faith of his government betrayed during the negotiations for an international peace treaty by double-crossing Japan at the very moment when she was handing over the naval supremacy in the Pacific to America.

The decision knocks Doheny's defense into a cocked hat. Instead of profiting $100,000,000 by saving the nation from " the menace on the Oriental frontier," the Elk Hills oil reserves revert to the government and Doheny is out of pocket over $10,000,000. The pearl harbor storage depot will stand as a permanent monument to his patriotism. It will also stand as a permanent reminder to Japan that America played the game, when the facts were known.

New Super-Power Invention

AFTER six years experiments, Frank G. Baum, a consulting engineer of San Francisco has developed a new device known as the " synchronizing condenser and regulator" which will make possible the complete electrification of railways and utilization of the nation's entire water power resources, bringing power within the reach of every farm house in the country. The device, which has been purchased by the Westinghouse Electric and Manufacturing Company, solves the problem of transmitting economically large amounts of power over distances of thousands of miles. The advantages claimed for the new invention are ;

1. It eliminates distance as a barrier in power and light transmission.

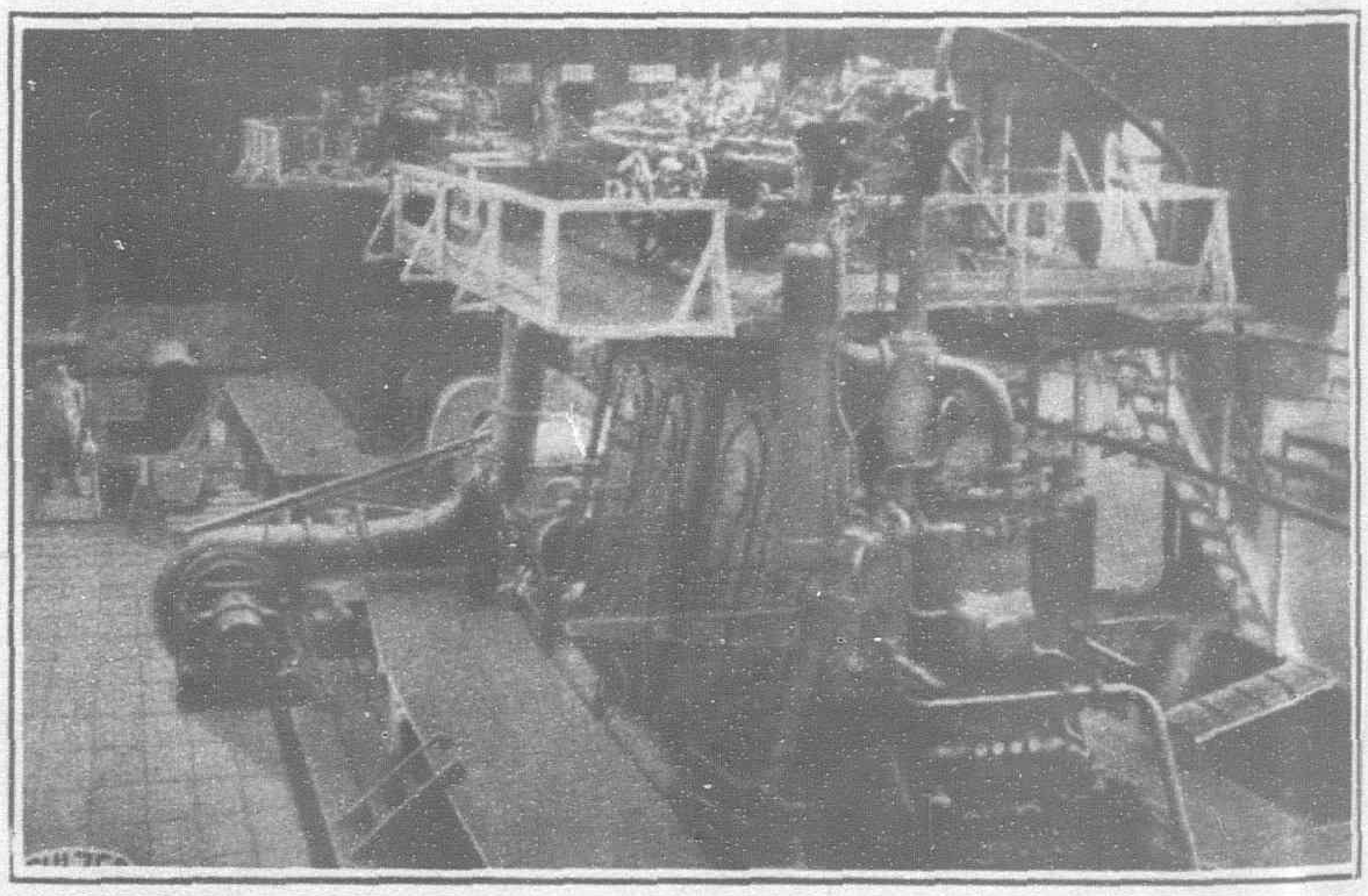
2. It increases the capacity of the amounts of power and light that may be transmitted over the wires.

3. It increases the efficiency of the lines in that just as much power reaches the destination as starts from the generating plant.

Practical experiments have been carried out for the past year successfully on the Pacific Gas and Electric Company's lines in California. The application of the device to Japanese super-power systems will revolutionize the present distribution and make possible the utilization of the Yalu River for generating power for the whole of Manchuria and North China.

Sulzer Two-Cycle Marine Diesel Engines in Japan

The illustration below shows, on the test bed, the first two Sulzer two-cycle marine Diesel engines built by the Kobe Steel Works, Kobe, who have acquired a licence from Sulzer Brothers for making marine Diesel engines. They are four-cylinder engines, each developing 2,000 H.P. at 110 revs. per min. and have been built for a 10,500-ton twin-screw cargo boat ordered by the Itaya Steam Ship Co., Hokkaido, and under construction in the Harima Dockyards, Harima.



Test Bed, in the Kobe Steel Works, Kobe, with Two 2,000-H.P. Sulzer Two-Cycle Marine Diesel Engines

British Trade and Industry

By Gilbert C. Layton, Assistant Editor of "The Economist"

(SPECIAL TO THE FAR EASTERN REVIEW)

The Steel Industry—A Comparison with the Pre-War Position

DURING the post-war years economists and others, having in mind the country's trade and industry, have earnestly repeated the dying words of Goethe. There was, therefore, much satisfaction when the Government decided to take a census of production in 1924, the previous census (and first) of which the results are available having been taken in 1907. The figures for the iron and steel trades have just been published. In comparing 1924 with 1907 it should be remembered that 1907 was the peak year of a trade boom. The output of pig iron in 1924 was no more than 7,345,000 tons, which was lower than the 1907 output by the substantial figure of 2,769,000 tons ; it should be noted, however, that the 1907 figure has only once been exceeded. The average value of pig-iron produced in 1924 was 91s per ton, as compared with 62s per ton in 1907, or an increase of 47 per cent; this excludes ferro-manganese and other expensive ferro-alloys produced in the blast furnace. The exports of pig-iron (excluding ferro-alloys) in 1924 were 485,172 tons, in contrast with 1,794,000 tons in 1907, so that 1,309,000 tons of the decreased production are accounted for by reduced exports.

As regards steel, the total quantity of steel ingots made was 7,737,300 tons, the addition of special steels and steel castings bringing the total to 8,016,300 tons ; the particulars of value relate to the value of the goods at the stage of manufacture at which they were sold or added to stock. The report states that so far as some items are concerned the figures may be understated. The gross value of the output was £149,622,000 and the cost of the materials used amounted to £105,447,000, thus making the net value of the output of the works covered £44,175,000 ; the gross value of the output in 1907 was £80,583,000. As 218,310 persons were employed (200,181 operative staff and 18,129 administrative, technical and clerical) the net output per person employed was £202. A word may be added regarding the persent position of the industries. Work is proceeding at a high level of activity and the largest firms are fully booked-up for six or eight months. But new orders have not attained the volume anticipated, so that there is a tendency to hesitate to prophesy anything like a permanent revival.

Strength and Toughness in Steel.

Air-hardened nickel chrome steels are widely used for the largest forgings in the heavy sections of the engineering industry, as they possess mechanical properties of the highest order. They frequently suffer, however, from the defect known as "temper-brittleness," that is to say, low resistance to shock when a sample is notched. The origin of this trouble is generally held to be slow cooling. Unfortunately, rapid cooling may easily result in other and almost equally serious defects. The desideratum is, therefore, a steel having the mechanical properties of the nickel-steels without the danger of "temper-brittleness." A large armament firm has achieved this combination by the addition of molybdenum to the nickel-chrome steel. Though this steel has obtained some publicity little is known regarding the general effects of the molybdenum addition, so that a Research Report (No. 67, prepared by Woolwich Arsenal and available to the public through the Stationery Office) on this subject is of exceptional interest.

Here it is possible to indicate the results of the tests only in barest outline. The increase of the molybdenum content in the steel slightly raises the A c l point and lowers A r l, but the effect on the latter varies considerably in different steels. Again, molybdenum has a more powerful effect than nickel or chromium in reducing the liability to imperfect hardening when the rate of cooling is low. It also reduces the softening effect of tempering. Finally, mechanical tests made after a comprehensive series of heat-treatments illustrate the general effect of molybdenum in improving the elastic properties, yield point, elongation and impact value of certain types of steel. It has a pronounced effect in reducing, in some cases of completely eliminating, the susceptibility to "temper-brittleness." In short, nickel-chrome-molybdenum steels provide the best all-round combination of properties, but they are closely approached by certain nickel-molybdenum and chrome-molybdenum steels.

The Coal Position

To-day the British coal industry, if judged by the volume of production, shows no sign of the disastrous stoppage of last year. The output for the week ended February 26, at 5,371,400 tons, was only 300 tons short of the output for the corresponding week of a year ago. The lengthening of the miner's working day, however, is clearly reflected, for only 1,012,700 miners were employed this year, as compared with 1,107,500 in 1926. Thus the output per man has increased. The industry is passing through a phase of prosperity. Though prices have been unsettled, they have so far been satisfactory from the industry's standpoint and markets have been found for the coal. A fair number of forward contracts have been placed, particularly on the export side, but to some extent buyers are hesitating owing to the prospect of lower prices.

This hesitancy is, indeed, a sharp reminder that the coal industry's prosperity is probably a temporary phase. On the demand side, conditions are largely artificial, for last year Europe's production of coal was 100,000,000 tons below normal. But this exceptional demand will have been overtaken in the near future—perhaps in the early summer ; output in the chief countries of Europe shows a rising tendency. In fact, conditions in the chief British centres are already somewhat "patchy." There is thus the prospect of a slump sooner or later, with the certainty of lower prices. To the miners this will mean a lower level of wages than they are at present receiving and they are bound to find this development very distasteful. It is not suggested that so drastic a weapon as the strike will be resorted to : the agreements recently concluded cover a period of from three to five years and the miner's trade unions are almost impotent through exhausted finances. Nevertheless, far-sighted observers, taking account of the market outlook for the industry and its probable reactions upon the labor position, are inclined to be pessimistic. Reason may compel assent, but it is hoped, that all concerned will deal with the situation more wisely than they have dealt with similar situations in the past.

Promoting American Friendship with Japan

FOR many years past the American Commerce Department officials have concentrated their energies in selling China to American manufacturers, and putting through the China Trade Act that was to expect to result in the organization of a flood of Chinese American cooperative enterprises. Our energetic Commercial Attache, Mr. Julean Arnold, was called home at least once a year to make the grand tour of the country and discourse before Chambers of commerce on the wonderful possibilities of the China market. So intense was this campaign that any American who suggested that Japan might offer an equal if not better opportunity for our activities, was placed under the ban of official displeasure. It is a sign of the times that Department of Commerce officials are now boosting Japan in the same way as they did China. Mr. De Forrest Spencer, assistant trade commissioner at Tokyo has been talking common sense to the Minneapolis chamber of commerce. He told them that "*loss of the United States trade would be calamitous to Japan, since America is her best customer.*

Fears of Japanese invasion and war are absolutely unfounded, he declared." Japan desires nothing better than the good-will of the United States since her greatest market is right here. Japan is also America's fifth best customer."

If Mr. Spencer reflected the views of the Department of Commerce, the Department is to be congratulated; if the thoughts are his own, he ought to be promoted at the first opportunity for having the courage to state the facts frankly. The Department of Commerce can do with a few more young men like Mr. Spencer in boosting Far Eastern trade. According to Mr. Spencer, Japan's doors of trade, which have been swung wide open to the occident, will bring to the northwest demands for several million dollars' worth of manufactured and agricultural products during 1927,

Hard grains, agricultural implements, cotton and textile machinery will be Japan's principal needs for the coming year. Mr. Spencer declared. Much of this, especially the grains, will be bought in the northwest because of the close proximity to shipping points, he explained.

"Japan is using more hard grains every year," which means that she will soon become one of the principal buyers of the agricultural products of the northwest. Her diet for years has been chiefly rice and fish, but the gradual change to western customs and her rapidly growing population have made it imperative for her to seek food in other markets.

"Japan has been buying large quantities of American made foodstuffs for several years, but recent developments in her industrial system have brought about important changes that she must eventually abandon the rice and fish as the principal foods in her diet."

Mr. Spencer, with E. M. Zwichel, Minneapolis district manager of the United States Bureau of Foreign Commerce, has been meeting representatives of business houses of the Twin Cities to point out how they can enter the trade marts of the orient.

"A number of Minneapolis firms already are represented in Japan," he said, "and many others are planning to sell her products manufactured here. Besides the agricultural products and foodstuffs, firms in the Twin Cities will place on the Japanese market such articles as gasoline engines, toilet articles, glue, pumps, electrical devices, household appliances, medicinal drugs and industrial machinery. No doubt, as information of the Japanese market becomes more general, other firms will enter it."

"It is true," he said, "that Japan needs more territory. Her population is rapidly expanding, and is crowding the country but some adjustment probably will be made that will take care of her problems."

The Eleven-Day Judgment of Samuel Untermyer

MR. Samuel Untermyer, one of the foremost lawyers of New York is making a tour of the world and spent eleven days in Japan. As he was leaving *The New York Times* induced him to record his impressions of that country by cable and although he starts out admitting that eleven days can hardly be said to furnish the necessary qualification for a matured judgment, he winds up by insisting that the Japanese lack brains and resourcefulness. He found all that out in eleven days. In that brief period Mr. Untermyer declares, he had exceptional opportunities for coming in contact with the life of the people. He probably spent a few days at Tokyo in the Imperial Hotel, has a look at the show places of Japan, Nikko, Kyoto, Nara and Miyajima, and may have wandered off to some village and stopped at a tea house or so. He certainly never visited any of the industrial centres of Japan or any of the homes of the higher class Japanese, yet his exceptional opportunities permitted him to form the following opinions.

"Notwithstanding the rapid strides of the past half century, the people still live comparatively primitive lives. Their homes are barren of what we would regard as the creature-comforts of civilized life. We found the most wealthy of them even in the great cities shivering with cold in flimsily built, unheated houses, without adequate clothing to protect them against the severity of their cold Winters and huddling around small open earthen jars filled with ashes and a few sticks of charcoal.

"Although the principal hotels are equipped with registers they emit no heat and the wind whistles through the flimsy window panes.

"My conception of the Japanese was so different from the reality that the disillusion has come to me as a shock. I pictured them as shrewd, subtle, resourceful, industrious and highly intelligent. Industrious they are, but they are the antithesis of all the others. They are imitative to the n'th degree and absurdly literal. If you send a shirt with a tear or a coat with a button missing to be copied they will make and deliver the new shirt or coat with the identical tear or missing button.

"I saw nothing in their industries that leads me to believe that we need reckon with them as serious business competitors for a long time to come, if ever, notwithstanding the cheapness of their labor, which, by the way, is growing perceptibly dearer and is higher to-day more than in many Continental countries. The cost of living is increasing here, as elsewhere, the people are poor and business at present is stagnant. They have not the capital to expand their industries, if they had the brains, and I insist that they lack intelligence and resourcefulness."

It is really wonderful how such a brainless people elevated themselves to the rank of a first class power, survived the great earthquake, stabilized their currency and built up a foreign trade in the face of world competition.

Mr. Untermyer is Chief Counsel for the New York Transit Commission where he is paid for his rapid decisions. His transit through Japan and rapid judgment on its people makes us wonder how he does it. Its rather a reflection on the intelligence of the Transit Commission.

Japan to Enter Cotton Conference

SECRETARY of Commerce Jardine is extending invitations to all foreign cotton exchanges and associations to attend a conference to be held in Washington on March 14 for the purpose of making up physical standards for American cotton to be observed during the next two cotton years. It is understood that the conference will be devoted entirely to the selection of type standards and that no extraneous matters will be introduced. Any "outside" questions would, should they arise, be left to some sort of a supplementary meeting; there will be no innovations at next month's sessions.

It is indicated that since the operations under the standards are harmonious, there will be none of the conflict that marked the first conference of this character that was held here some years ago. In advance of the session, the cotton from which the standards are to be made will be assembled in the Bureau of Agricultural Economics and the preliminary work of making up the boxes will be done so as to save the time of the visitors.

The Japanese Cotton Merchants' Union, is desirous of being represented at future meetings of this character. It is said that the possibility of including this association in the present group has been under discussion both in this country and in Europe. It would be necessary, of course, for all of the present signatories to the agreement to consent to the inclusion of the Japanese. While there has been discussion, no definite understanding has been arrived at.

There was some thought of having a representative of the Department of Agriculture in Europe visit the officers of the various organizations, parties to the existing agreement, with a view to sounding out sentiment as to the admission of the Japanese association, presenting to each the formal request of the association. It is not known here whether that action has been carried out.

The matter is of greater interest to the foreign organizations since it means a readjustment of the vote in the event that the Japanese Merchants' Union and the Japanese Spinners' Association are admitted to the conference with voting power. The splitting of the vote originally was productive of considerable controversy, the Liverpool Cotton Association having been dissatisfied with the apportionment of control. The voting power of the United States in these conferences is not affected by any apportionment or reapportionment, nor does this country seek to interfere in any questions of division of voting power among the foreign associations.

Some Conditions in Japan and China

By Emory R. Johnson, Dean of the Wharton School of Finance and Commerce, University of Pennsylvania

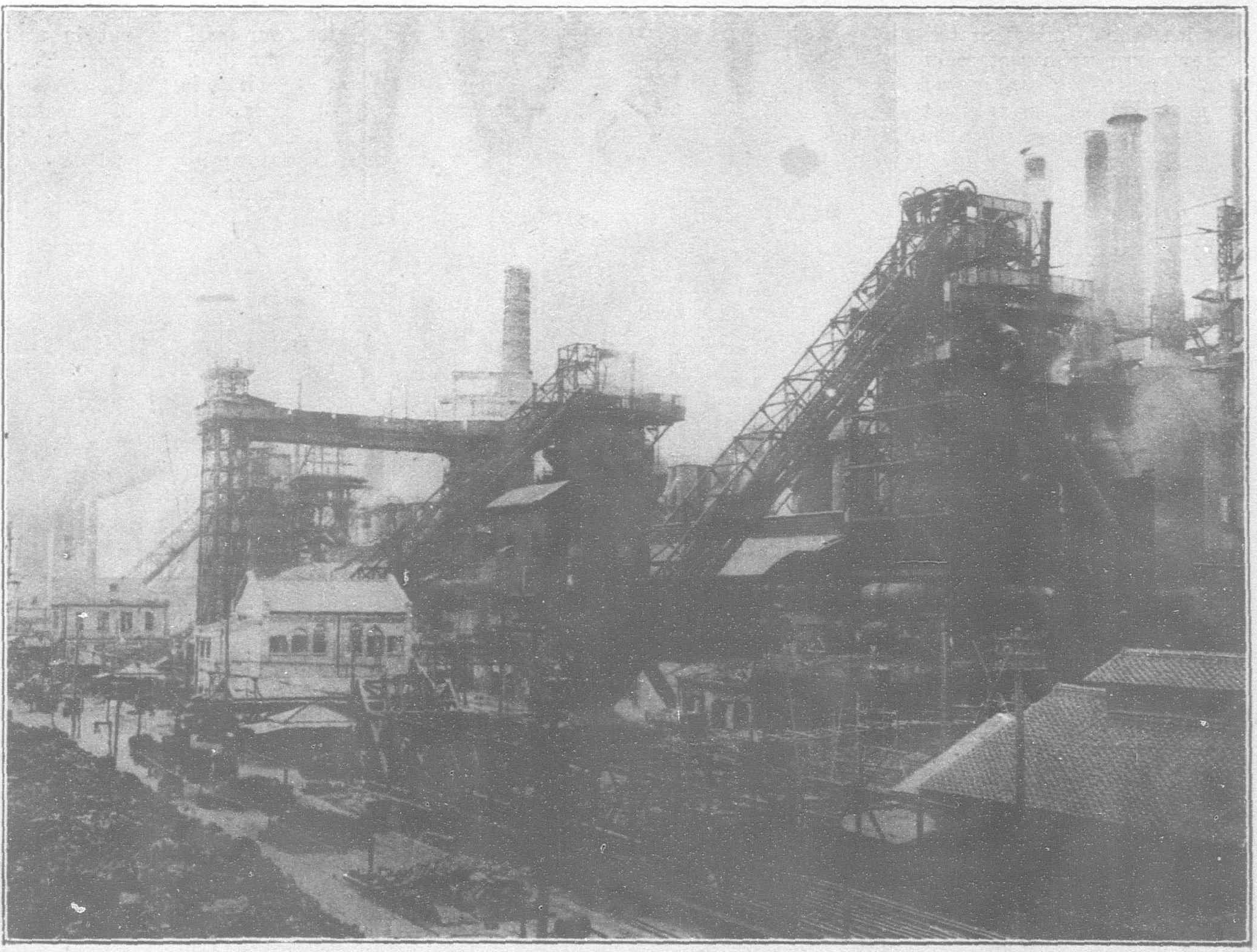
Professor Johnson visited the Far East last Summer and was given every opportunity to study conditions in China and Japan. His address, delivered before the Engineers Club, which we publish in full, is an excellent first hand summary of the situation by America's outstanding railroad authority.

A HALF-HOUR discussion of Conditions in China must necessarily be limited to a brief consideration of some of the most important facts. The subject is large, and I shall attempt to consider only a few topics. As I shall speak in a personal way about some experiences, it may be well for me to start by telling how I came to visit the Orient.

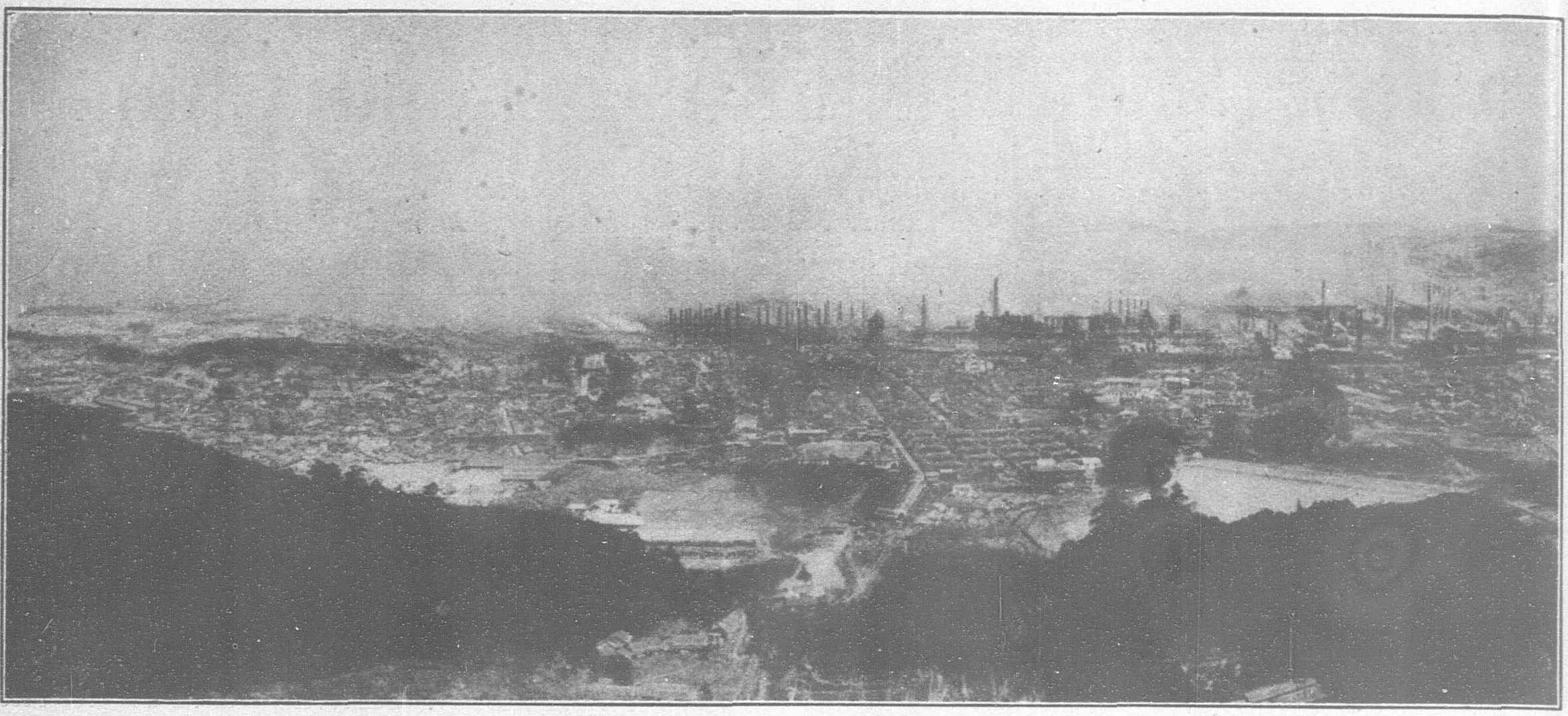
For many years it has been my privilege to have in my graduate work at the University of Pennsylvania officials of the Japanese Railroads. They have been coming here year after year to study traffic and related problems at the University and first-hand with the railroad companies. Several Chinese railroad officials have also been students of mine and more of them have been students at the Wharton School, from which they graduated, the Wharton School being the undergraduate part of the work in Business Education. As it happens, the Director of Traffic of the Japanese Railways for many years was an intimate friend of mine. The Director-General of the Railway of China and the Traffic Director are graduates of the Wharton School, of the class of 1909, and they are but a few of the officials who from year to year were kind enough to ask me to visit their country. For several years, I was prevented from accepting the invitation, which was seconded by the Alumni of the University of Pennsylvania in Japan and China, but finally, this last summer, I felt I could go, and so I went.

Japan

It seems desirable to say just a word about Japan because there are many people who look with apprehension and suspicion upon the Japanese. I have none of that feeling myself, and I feel that possibly those who fear Japn in a political sense may have not seen the subject in all its aspects. Japan has a political problem for



Blast Furnaces of the Imperial Japanese Government Steel Works at Yawata



General View of Imperial Japanese Government Steel Works at Yawata, Kyushu

the future, but it does not involve the United States. Japan's political problem of the future is Russia.

The greatest heroic effort of Japan has been to hold Russia back from controlling Eastern Asia. The present situation of Russia, which makes her weak, is presumably a temporary one. Russia will again organize, and when she does, she will resume her pressure towards the East. Japan realizes that the time will again come when she will have to resist Russian pressure. That realization is the key to Japan's policy in Korea and in South Manchuria. It would be political suicide for Japan to become involved in any serious controversy with the United States. She would simply use up her store of energy in a conflict with a power infinitely stronger than she is, and put herself in the position of being at the mercy of her real rival which is Russia.

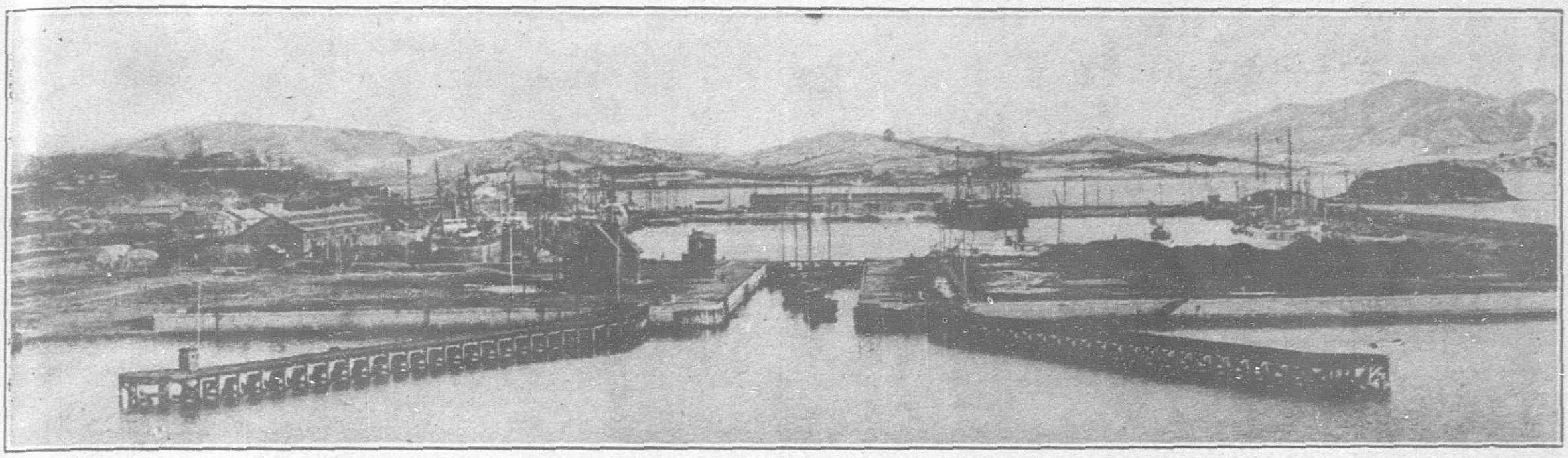
The apprehension that some people have in regard to Japan is probably due to the realization that Japan is forging ahead very rapidly in manufacturing and in industrial development generally. Japan is a perfectly marvelous country as regards its power of co-operation, and I emphasize this fact because, as I shall point out presently, Japan in this regard is exactly the opposite of the Chinese. The Japanese people are all one family. They feel that they are. It is not a mere phrase to be quoted. Their school books, I think, still carry what you and I and the educated Japanese also would recognize to be a legend,—the statement that the Japanese people are descended from the grandson of the Sun Goddess, and that the present imperial family of Japan are lineal direct descendants of the Sun Goddess. Although this is now regarded to be a legend, it explains in part the feeling which even the most cultured Japanese have, that they are all associated in one common political family for a common national purpose.

Their government is highly efficient, and is one of the most honest governments in the world. When the Japanese engage in manufacturing, shipbuilding, shipping and commerce, they have no difficulty whatever in organizing and conducting in an effective manner, large corporations. They have the ability to co-operate in a high degree. Japan is becoming a large manufacturer of textiles and builder of ships; and in consequence is taking away from us some of our present markets in the Orient. There is this consoling fact, however, that the more highly developed industrially a nation becomes, the greater does our trade with that nation become. Our greatest trade is with England; by far the largest trade with any of the continents is with Europe, and to the extent that Japan and the Orient become industrialized, not to that extent will we lose our markets, but in that measure will our trade increase. This fact may well be kept in mind by those who think of the present export of cotton cloth and other American goods to the Orient. Japan may become the Great Britain of the Orient within a generation, but that will not be to our commercial disadvantage.

Marshal Chang Tso-Lin

Korea

Crossing from Japan to Korea, one finds himself in a land that is no longer "hermit kingdom." Ten hours from the time one lands at Fusan on the south coast of Korea, one is in the capital of that kingdom, Seoul, or Kaijo, as the Japanese call it, a city with broad streets, and automobiles in considerable number along with other kinds of vehicles. It is a city being modernized, perhaps too rapidly as far as aesthetic or cultural reasons are concerned, by the very efficient administration which the Japanese are giving Korea. If you visit as I did the mountains in the northeastern part of the country, and thus travel sixty or one hundred miles beyond the railroad, over the part of country occupied by the poorer people, you will realize the great possiblity for the betterment of the eighteen or twenty million people there are in Korea, a possibility which is being made real in accomplishment by the Japanese Administration.



The New Wet Dock at Jinsen (Chemulpo)

China

My entry into China was by way of Manchuria, and at Mukden I met General Yang, the Chief of Staff of Marshal Chang Tso-lin, and was entertained by him, and by the civil governor of Manchuria, with both of whom I had conversations of some length, and from whom I got a little insight into the political problems of Manchuria. However, I am not going to dwell on Manchuria's problems because there are other things I want to discuss.

First of all a few words about the economic situation in China. China, outside of a few cities, is a man power country, and for the most part within its cities industry and transportation employ human energy rather than applied mechanical power. To comprehend what this signifies is difficult. Practically all of our wants are supplied by mechanical power. We live in a mechanical age, and are accomplishing large things because we have harnessed efficient power to serve us. The Chinese people, however, depend upon human power. In a city of 800,000 people like Tientsin, there are almost no horses. Some automobiles and trucks are used but you will see thousands of carts loaded with a half ton to a ton of freight, being hauled by four or five men. Five men easily have the draught power of a strong horse. The five men will cost the employer possibly a total of 75c to $1.00 gold a day. I doubt whether you could own and maintain, in China, a draught horse for 75c a day, gold. Human power, even when it is applied to hauling freight on the roads and streets, is probably the cheapest power in China at the present time.

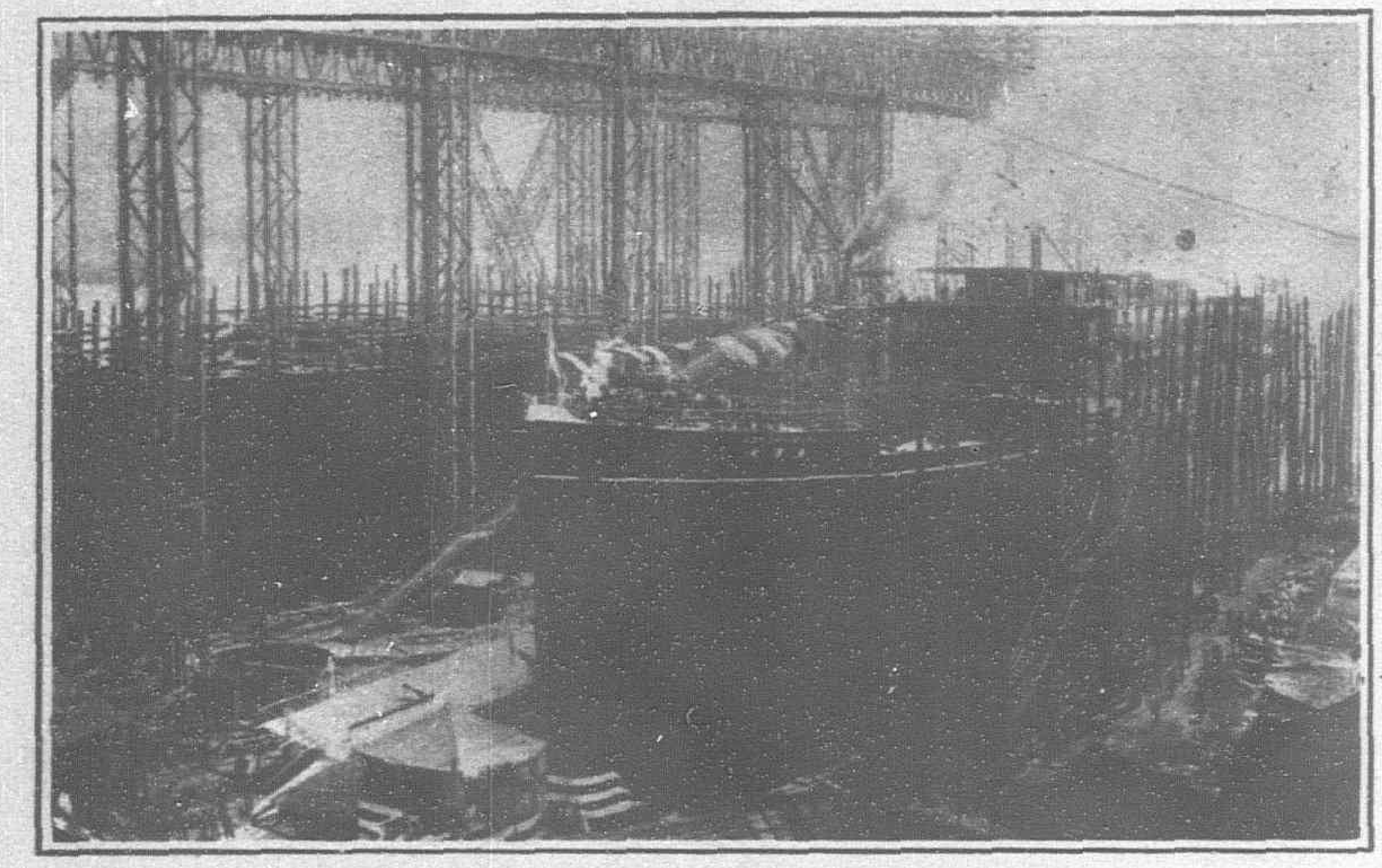
I can best illustrate the effect that the use of human power had upon me by referring to what I saw in the port of Tsingtao, the port which the Germans built. They had been in possession of it only a few years, however, when it was taken over by the Japanese, and as the result of the Washington conference it was turned over by the Japanese to China. Among other things shown me on my visit there was the port. As we drove to the harbor our cars stopped a block or so short of the long pier and as our party walked down the street along the water front, I saw a long train of heavily laden carts being drawn toward the city from the pier by man power. The fact that I paused a moment to look caused the man I was with to say, " You may be interested in knowing what wages those men earn each day. They are probably earning from 20c to 40c Mexican." Forty cents Mexican would be 21c or at most 22c in gold. " If they work the entire day, from sunrise to sunset, in continuous employment, they may possibly earn $1.00 Mexican," which would be 53c. That indicates the cost of that kind of power.

As we walked down the pier, we passed a ship being bunkered by coal that was being carried aboard in baskets. A little farther down the long pier we came to two warehouses, and I saw a string of heavily laden carts that were being hauled down the pier from the city. " Can you tell me," I asked, " where these carts come from ?" They explained that the carts were laden with goods and produce that had been brought into Tsingtao largely by rail, and partly by other means, purchased by the buyers there, and stored in " go-downs " or warehouses in the different parts of the city, and that these goods were now being brought to the pier to be put into the warehouses. Later they would be taken out of the warehouses and loaded on vessels for shipment abroad or to other parts of China. I asked, " Why not have railroad tracks between the warehouses and the ship ? Why collect goods in the 'go-downs' in the city and haul them down here by hand and put them by hand in the warehouses and later take them by hand out of the warehouses and carry them across the intervening space on the pier and put them in ships ? Why not minimize, as we attempt to do at home, the handling of freight by man power ?" The answer was, "This is our way of doing it."

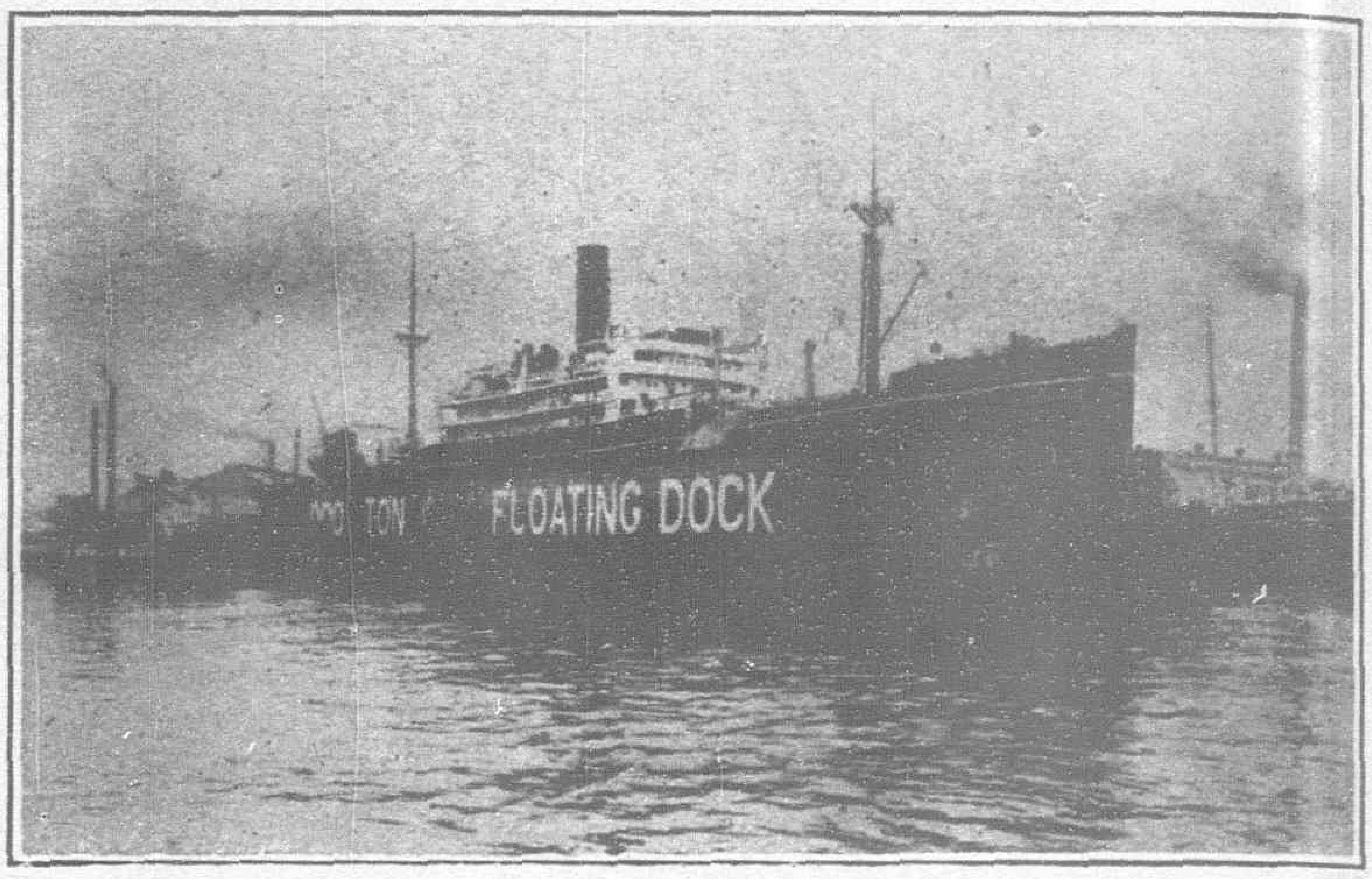
Getting into a tugboat, we went around the harbor and then got off near the end of the breakwater which was widened into a pier at the end, and I saw a string of railroad cars laden with coal being unloaded. The cars were open top gondola cars with solid bottoms and fixed sides. The coal was being shoveled over the top of the sides to heaps alongside of the tracks. I was told the coal was for bunkering ships. " Why not have a trestle," I inquired, " have cars with drop bottoms, run the cars up on to the trestle, drop the coal into pockets, and let the coal go by gravity into the ships ?" The reply was, " That is not the way we do it here." We could see the entire harbor from where we stood, and there were no mechanical appliances to be seen in the port of Tsingtao. This illustration is significant because if mechanical power were to be used to reduce human labor, it would be at a large port where there are at least two million tons of coal brought for shipment by water beyond, not to mention the large quantity of products from the fertile province of Shantung.

From time to time as I watched the effects of a surplus population and of cheap human power upon economic life, I asked myself, " What, if anything, is ever to change this ? Is China always to be static, or will it somehow or other become dynamic ?" The question troubled me for some time, until the thought came to me that it was only the third generation back when American families were large, when there was very little check upon population in the United States. I have lived long enough to see the American family change in New England and in the South and in the West from a large to a small family, due to the pressure of a

Gen. Chiang Kai-Sheck



Mitsubishi Ship-building Yard, Busy Building a Big Ocean Liner of 9,835 tons



The Great Dock in the Mitsubishi Ship-building Yard, Kobe

rising standard of living. The standard of living the American people have adopted is so high that large families are impossible. Perhaps our standard of living is too high! I am not at all certain but that it may be.

In China, there are no artificial checks upon population. Each generation brings into existence an equal number of people to live under the same conditions that the present generation lives under. Will something bring about an increase in the wants or desires of the Chinese people? Will they want more clothes, better houses, sanitary conditions of living and education for the masses? Will these things, which constitute a higher standard of living, come to be desired by the Chinese people? If so, then we shall see the working of the standard of living in the reduction of the size of the family.

One of the many men I talked with in China was the Mayor of Shanghai, Dr. Ting, who was educated in England, and has traveled in this country. He is a mining engineer, who gave up his mining engineering work and took his present position at a reduction of $8,000 per annum in salary in order that he might undertake the task of organizing the government of the Chinese port of Shanghai. He said, "You may not be able to see the social forces that are operating in China." He referred to the fact that the educational system of China had been modernized more than twenty years ago, that modern education had really been adopted in the cities, and that it would gradually make its way through the villages and the rural parts of the country. He also called attention to the press in China; he spoke of the labor agitation, resulting from organization and propaganda.

The Present Political Situation in China

That there is a ferment in China is evident. The present political situation is one indication of that ferment; and, though not so easily seen, there is an economic ferment that will produce in time—not immediately for things don't change over night in China—different social standards and bring about the substitution of mechanical power for human power. Population will be checked. Man power will cost more, and machines will be more largely used. With that substitution will come a different economic order in that great country.

Everyone is interested in the present political situation in China. It is complex, and yet, in a way, it is fairly simple. The Central government has become weak, but we may well remember that China has never had a strong central government. Although one of the oldest countries in the world, with a recorded history that goes back five thousand years and more, it has gotton along for the five milleniums without a strong government. The Manchu power was swept aside in 1911 by the Revolution, and in 1912 a republic was set up. Republican institutions have not succeeded. The Parliament met twice but accomplished very little. The power, such as was created by the constitution, became resident in Yuan Shih-kai, the first president of China. He was the government of China, but he lived only a few years and the power of the Peking government passed to the Provinces. It happened in this way. The President, under the constitution, appointed the Governors of the several Provinces, twenty-one in number, which territorially correspond roughly to the States in the United States. The conditions of disorder which followed the Revolution made it necessary to have military forces and military governors in the Provinces. In a short time, the civil governors became subordinated to the military governors, and from among the military governors there have emerged quite naturally, certain men stronger than the others. The government of China to-day is in the hands of five or six men.

In the north are the three large Provinces of Manchuria. Marshal Chang So Lin is the dictator of that part of China. To the Northwest is the territory dominated by the so-called Christian General, Feng. The section including Peking, on the North, and until a few months ago, Hankow on the Yang-Tse River to the South, was the bailiwick, when I was in China, of Marshal Wu Pei-fu. During the nine days of my stay in Peking, which was in the latter part of July, 1926, the siege of Nankow pass was going on. The pass is only twenty-five miles in an air line, from Peking, but we hardly realized that a war was going on. Marshal Wu Pei-fu later captured Nankow pass, and drove General Feng back. The Marshal's star was in the ascendant. In the short time that has since elapsed, he has been eliminated from the picture, having failed to withstand the pressure of the southern forces that have come north, taken Hankow and Wuchang and have pressed down the Yang-Tse River to the important city of Kiukiang on the Yang-Tse River, which they have also captured.

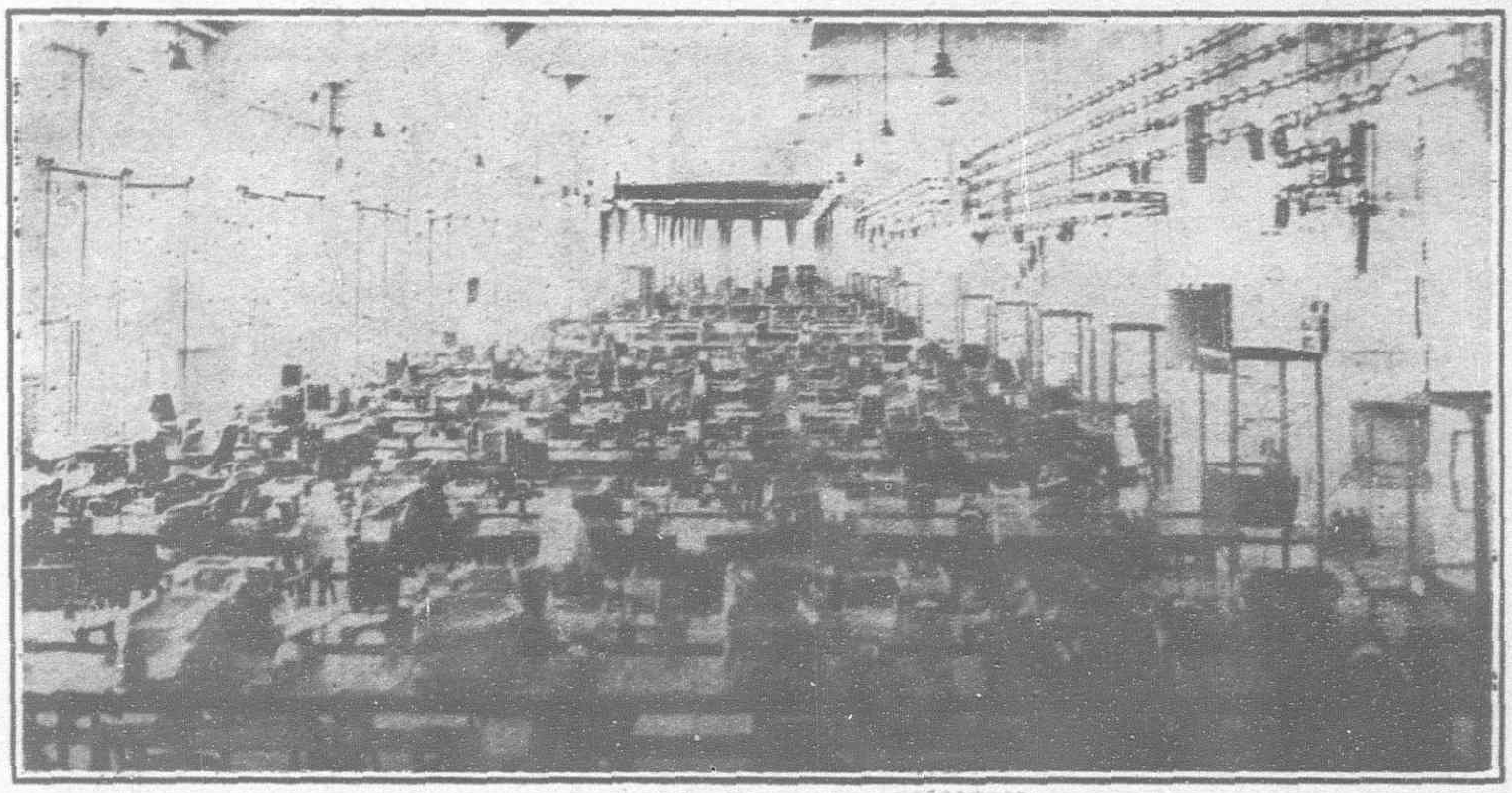
In the Lower Yang-Tse Valley Marshal Sun rules. Marshal Sun had been told of my prospective visit to Nanking and Shanghai, and that part of China, and in consequence I was shown every possible courtesy by the political authorities not because of his interest in me or in what I had done, but because the man who was entertaining me was one of his right hand men, the Director of the Railways of the Shanghai-Nanking and the Shanghai-Hangchow Railway. Mr. Yin was authorized to do everything possible for me.

I had two interviews with Marshal Sun who is one of the most interesting and one of the ablest men I have met, a man with a clear, direct mind, a man who is desirous of doing what he can to build up the five Provinces that he then controlled. He is the military governor of Kiangsu, in which Nanking and Shanghai are located, and is, or then was, the commander-in-chief of the military forces of four adjacent Provinces. The total population of the five provinces is about eighty million people, so when I talked with Marshal Sun I conversed with the dictator of eighty million people. At the dinner the Marshal gave, I was anxious to bring up the subject of government. When one is the guest of a dictator, it is rather embarrassing to discuss the question of government, so I had some difficulty in bringing the subject forward, but when I did the Marshal took up the discussion with surprising interest, sketching with a pencil as he talked. He said, "As you know, local government in China has never given us any trouble." He mentioned the well-known fact that the social unit in China is the family, that all three generations live together, if possible, in the same compound, that there is a head to each family which is a self-contained social and governing unit. The relations of one family unit to the next family unit are determined by age-long traditions; and local government takes care of itself. It is this fact that has given stability to China down through the milleniums.

(*Continued on Page 156.*)

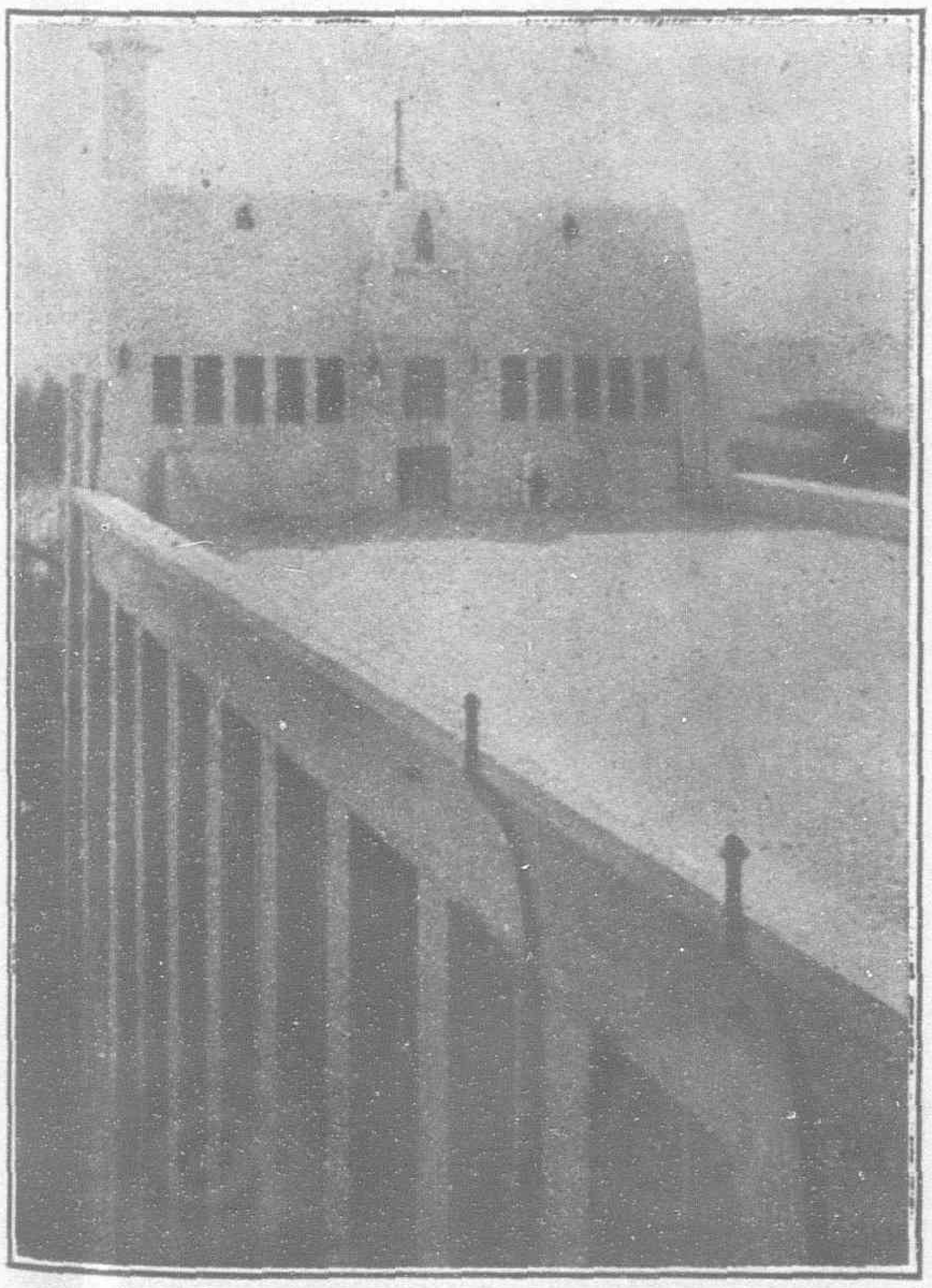
The New Building of the Tokyo Central Telegraph Office

THE construction work of the Tokyo Central Telegraph Office in the centre of the city had been started in 1922. In course of construction, however, the work suddenly came to a standstill because of the great earthquake and fire which visited the city in September of the following year, causing so severe damage to the building under construction that it had to be built over again. Since then, a good progress has been made in its rebuilding work, bringing about a completion of the whole building in July, last year. The new building stands on the lot covering an area of 3,341 tsubo. It is of six storied, reinforced concrete being used throughout. With the up-to-date equipments installed therein, the premises made its appearance newly in the centre of the Capital as Headquarters of the entire central service of telegraphic function in Japan as well as of her international communications.


Machine Room

Principal Equipments Installed

Operating Machine, six seater	3 sets
,, seven ,,	35 ,,
,, special ,, ,,	1 ,,
Automatic Operator	43 ,,
Pneumatic Tube Equipment	4 ,,


The New Central Telegraph Office Seen From its Top

Transmitter and receiver, simplex, duplex, quadruple-duplex.

The connections between these installations are made by means of a belt conveyer with a total length of about 3,400-ft. There are 2 systems in the cord conveyer. Lamson carrier has 33 systems with a total length of about 7,000-ft. in connection with 130 places. The communication with 21 branch offices in the city are effected by means of pneumatic tubes comprising 14 3-in. tubes and 30 2¼-in. tubes. The air to be required for this purpose is 12-lb. per 1 square inch for compressed one, and 7.5-lb. per 1 square inch for rarefied one. Five sets of blower, each 115 h.p. installed in a generator room are responsible for the operation of the pneumatic tube equipment. By this means, rolls of telegrams can be transmitted from the central office to any of the branch offices in the city through the underground tubes. To the nearest offices such as Surugacho Office and Kakigaracho Office, for instance, they can reach within one minute, and even to the remotest districts as Shitaya or Fukagawa, it does not require more than several minutes.

Special Features in the Equipments

In addition, the following are found among the equipments newly adopted:

Western Electric Quadruple-duplex Printer.

Morkrum Quadruple-duplex Printer.

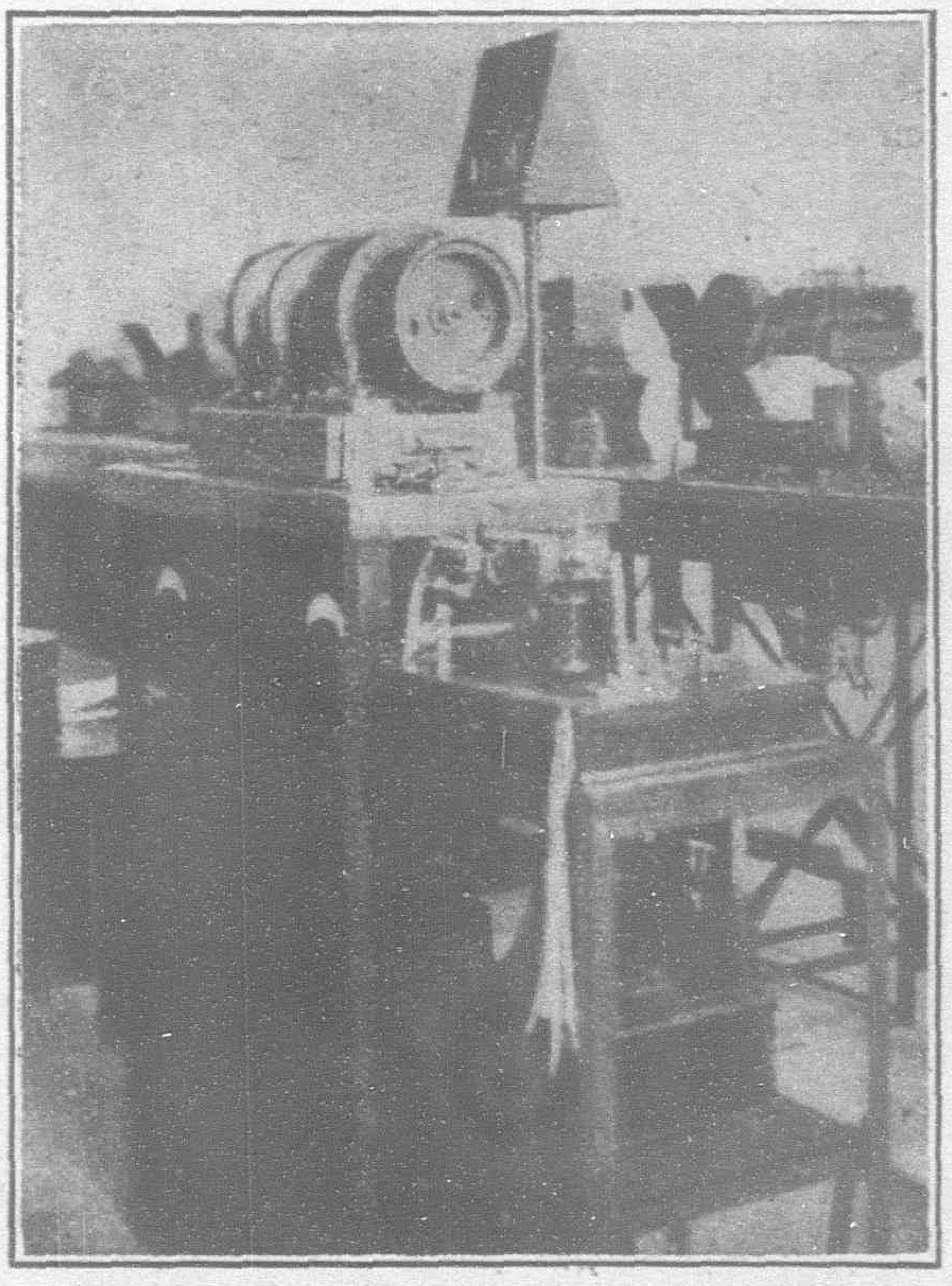
Podou Quadruple Printer.

Teletype.

Printers for telegrams in Japanese.

Kleinschmidt Keyboard Perferator.

Heurtley's Magnifier is installed for the Tokyo-Guam submarine cable. For the direct communications between the telegraph offices in the city as well as in the suburban districts, Relay Automatic system has been adopted, this being suitable for both telegraphic and telephonic communications.


Distributor for Western Electric Quadruple-Duplex Printer

Number of Machines in Operation

The following indicate the machines in operation and their number.

Sounder simplex	167
Sounder duplex	65
Automatic duplex	30
Telegraphic printer	3
Morse simplex	10
Morse duplex	2
Kleinschmidt keyboard perforator	168
Typewriter	292
Telephone	26
Siphon recorder simplex	9
Communication controller	3

and several other equipments.

As the electrical sources for these applicances, 10 sets of motor generator ranging from 12 to ½ kilowatt and 186 secondary batteries, 400 to 30 Ampere are provided.

The total number of the circuits is 284 with a total length of 16,000 *li* which comes to 26 per cent. of the total length of the telegraphic lines throughout Japan. The employees in the new central office number 2,103. The number of messages handled per day is about 139,000, of which about 6,000 are despatched from here. The revenue for the messages despatched amounts to about Y.6,000 per day.

In order to keep correct time, 122 Western Electric clocks are provided in the rooms in the premises.

On the fourth floor of the building is the Tokyo Wireless Station which controls the Kemigawa and Iwatsuki stations.

Some Conditions in Japan and China

(Continued from page 154)

Marshal Sun's next remark was, "The simplest problem of government in China will be the one first solved." That sounded sensible, and he continued, "You know that the political subdivision above our villages and purely local communities is the district of the Province." In his own Province of Kiangsu, there are 46 districts, which correspond roughly in size and number to the counties in Pennsylvania. The first problem of government worked out, the Marshal said, will be the organization of the administration of these districts, and when they function effectively, the development of government in the Provinces will follow. The evolution of the Provincial government will go on at the same time that the government in the Districts is being developed, but being a longer process it will end later. It is the Marshal's opinion that when the several Provinces of China have worked out their political problems they will establish, presumably by delegation of powers, a real central government.

That seemed to be a logical and convincing theory of political evolution and it interested me for two reasons. First, because it is the old Anglo-Saxon way by which governments have developed. Such was the process in this country. First there were the scattered settlements, in time the settlements got together and the several colonial governments were created. In the course of time these colonies became States. The States established, first a weak central government, and then after a short and unfortunate experience, a strong central government. The government thus established has, in the century and a third that has elapsed, evolved into a strong and very effective national government. Such has been the line of political evolution here. Marshal Sun says it will be the course of political development in China. The theory interested me also because that kind of development is slow. It takes time. China, under this process of political evolution will not have a strong central government in your day or mine; it may be a hundred years, possibly, before the evolution is completed.

That last night I was on Chinese soil I was entertained by the Alumni of the University of Pennsylvania. The toastmaster was a man by the name of Quo. He graduated from the University about 1910, and is a man of consequence in China, having been Vice Minister of Finance in 1920. He is now President of the College of Commerce at Wuchang, recently captured by the Southern forces. I brought up the subject of government, and without his knowing that I had talked to anybody else on the subject, he gave his theory, which was practically the theory that Marshal Sun had expounded two or three weeks previously.

The present political situation in China is uncertain. The Southern part of China is controlled by the Canton forces, now led by General Chang Kai-sheck. General Chang Kai-sheck in the South, Marshal Sun in the lower Yang-Tse Valley, Marshal Chang So-lin in Manchuria, General Feng in the northwest are the governments of their parts of China. The central part of China, including Peking, is now in dispute. Chang So-lin and Sun, with the support of the military governor of Shantung, have now united to stem the advance of the southern forces and if possible to drive them back.

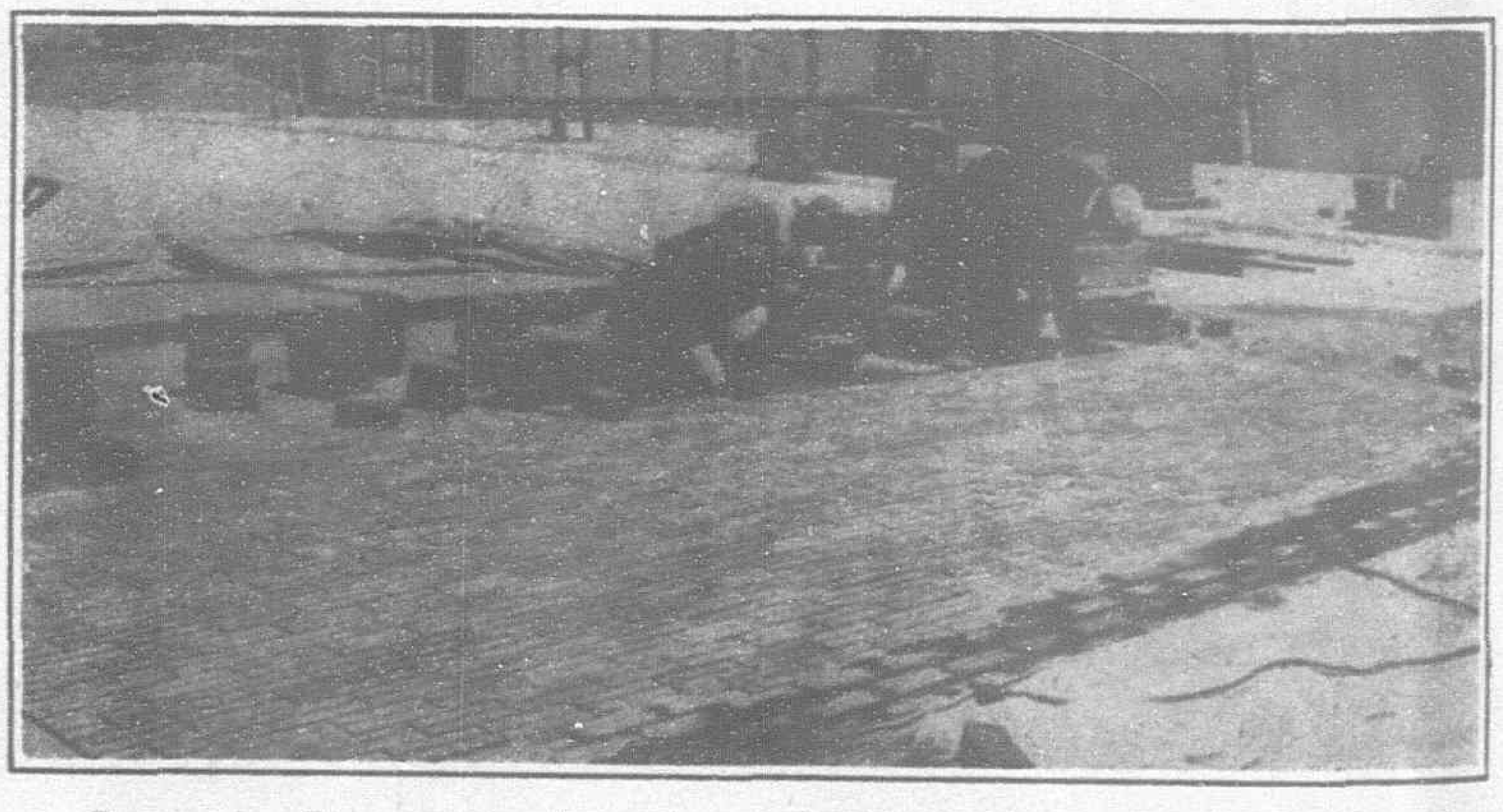
Of course, one never knows what may happen over night in China, particularly under present conditions of contention among the military governors. I wouldn't dare predict what the outcome of the southern advance will be. My thought has been that the advance would wear itself before Shanghai and Peking are reached, and so it probably will, unless the radical sentiment in China, under the stimulus of Russian propaganda, is strong enough to enable the southern forces constantly to recruit their strength and gain new forces as they advance to the occupation of new territory. I have no way of measuring the extent to which this anti-foreign and radical feeling can be capitalized for the overthrow of the northern war lords by the Cantonese forces led by Chang Kai-sheck. My guess is that Chang Kai-sheck within a year will be back in Canton and that China will be ruled by a number of war lords for several years to come. This is a mere guess, however.

Grooved Brick Pavement for Grades in Tokyo

By H. Sakakibara

A PAVEMENT of grooved brick has recently been completed on a steep heavy-traffic street leading from the central railway station in Tokyo, Japan. The bricks are 8 by 4 by 3½-in., lugless, with a longitudinal groove in the 4-in. side on top. They are laid with mortar filler on a mortar cushion on a concrete base. Care in the mortar bed and concrete base construction are the particular features of the construction.

The subgrade of clay was graded and rolled to profile and on this the 1 : 3 : 6 concrete base was laid to crown and finished with all the exactitude of a concrete pavement using a finishing machine. Templets and straight-edges were used to check the surface both transversely and longitudinally. The 1 : 3 mortar bed was laid ½-in. thick; a templet riding ½-in. high on the side forms strucks off the mortar bed. The bricks were laid by hand, as shown by the view, using trowels and lines and filling the joints with a 1 : 1½ mortar. The bed mortar was machine mixed and wheeled to the work. Other details are indicated by the view. Tests of the pavement for foothold using heavy horse-drawn loads indicate that it will meet the situation.—*Engineering News Record.*



Japanese Pavers Laying Grooved Brick Pavement in Tokyo

The Rise of the Cotton Industry in Japan

THE Japanese cotton industry was established in 1867, the first mills being erected at Kagoshima, in Kyushiu. For many years only a very moderate degree of success was attained, and, writes Mr. M. W. B. Cunningham,* British Consul at Osaka it was not until 1896, in which year the import duty on raw cotton was abolished, that the industry became one of national importance. By 1899, however, exports had reached a total of thirty million yen, consisting almost entirely of coarse count yarns.

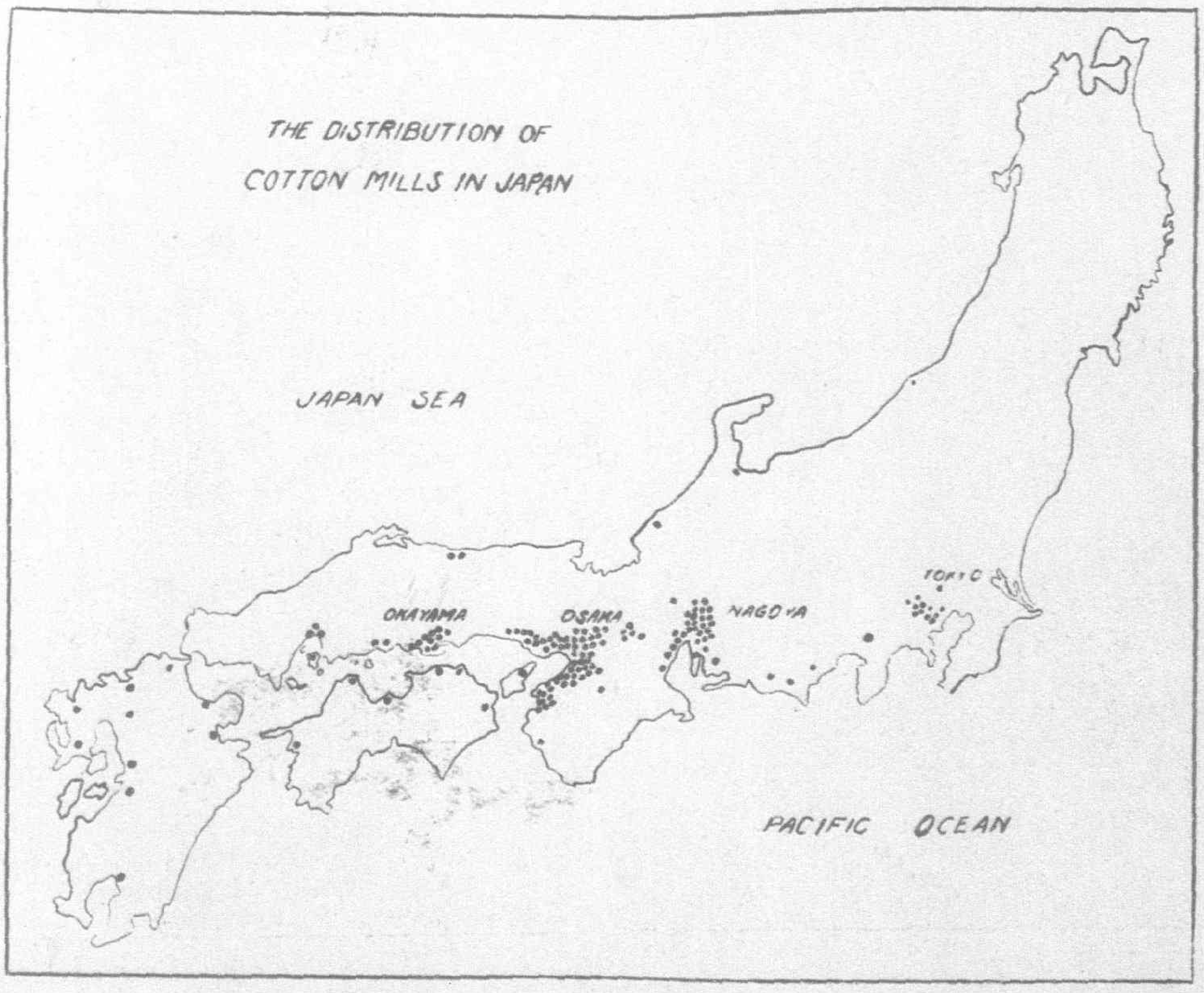
With the gradual advance in the standard of living in Japan and the development of the export trade the Japanese mills first began to turn their attention to a slightly finer range of counts in 1905, and exports in that year amounted to 49 million yen in value, of which 16 million yen represented piece-goods. The total production of yarns in that year reached 900,000 bales, out of which a total of 267,000 bales were exported.

It was, however, the European war which accorded to the industry its great opportunity and led to unprecedented development. Not only did Japanese manufacturers find themselves freed from competition in their main market—China —but, owing to the incapacity of England and other regular suppliers to meet the demand, they were enabled to build up a great trade in substitute goods with markets such as India, the Dutch East Indies, South America, Africa, and other countries to which they had not previously found entry.

After the restoration of peace the Japanese industry suffered, with those of other countries, from the post-war slump of 1920 and 1921, and the export of Japanese cotton goods, both yarns and textiles, to the war-time markets fell off to a marked degree. Exports to pre-war markets, such as China, on the other hand, were fairly well-maintained in view of the unfavourable conditions prevailing.

But since 1921, notwithstanding the earthquake disaster in September, 1923, the industry has resumed the progress temporarily checked by conditions arising from the ending of the war. In 1925 production, both of yarns and textiles, attained record figures, which, considering the difficulties which still beset the world's cotton industry, must be regarded as a real achievement. In this connection it should be remarked that, with the exception of the silk industry, the cotton spinning and weaving industry is the only one of Japan's industries which has, on the whole, emerged unweakened from the post-war period—a fact which may be ascribed to three causes, namely, the natural suitability of the country for an extension of the industry, the excellent manner in which it is organised and managed, and the strong foundations established in the course of the past quarter of a century.

There has been a tendency in Japan during the past twenty years to establish industries and protect them with a high tariff wall, irrespective of whether natural conditions admit of their ever becoming prosperous and ceasing to need protection. The cotton industry, however, has, so far as can be ascertained, never been in receipt of any direct aid from the Government in the way of subsidies or other financial assistance, and those responsible for the management of the affairs of the many large and important spinning companies do not seem to be anxious for direct help from this quarter. At the same time the Government are keenly alive to the importance of the industry, and may be counted on to foster its further development by all the means in their power. It was, in fact, recently reported in the press that the Department of Commerce and Industry in Tokio was contemplating the establishment in the capital of a cotton research station for the purpose of conducting experiments in connection with the spinning of yarns of finer counts than any usually produced by mills in Japan, but no definite information is available as to whether the plan will materialise or not. It is doubtful, however, whether the scheme will have the approval of the leading companies, the majority of which are quite content to go their own way and trust to their own initiative for further expansion of their business.



Financial Position of the Industry

Statistics provided by Mr. Cunningham in the course of his Report show that while the number of member companies of the Japan Cotton Spinners' Association increased from 51 in 1903 (there were only 43 in 1918) to 54 in 1925, the spindles owned by them rose from 1,381,000 in 1903 to 5,186,000 in 1925, and their looms from 5,043 to no less than 68,160.

The paid-up capital of the Association, which controls at least 90 per cent. of the total spindles of the country and between 40 and 50 per cent. of the power looms utilised for cloth of greater width than the Japanese standard 15 inches, had grown in the meantime over tenfold from 34,029,000 yen to 351,805,000 yen, with reserve funds amounting to 221,778,000 yen, as compared with 5,123,000 yen 22 years before. There was an enormous increase in every respect during the decade 1916-25, authorised and paid-up capital having increased over four times, the value of fixed assets nearly as much, and reserves more than five times. This development was especially noticeable between the years 1918 and 1922, during which period practically all spinning companies increased, and in some cases doubled, their capital, while in several instances large distributions of surplus profits were made to shareholders in the form of issues of bonus shares.

Some idea of the enormous prosperity attained by the industry as a result of the expansion due to the war may be gathered from further statistics furnished by Mr. Cunningham, which show, by half years, the gross earnings and distribution of profits of cotton spinning companies in Japan during the period from 1916 to 1925. An examination of these figures will show that the industry may be said to have rached the zenith of its prosperity during the year 1919 and the first half of 1920, during which period the total

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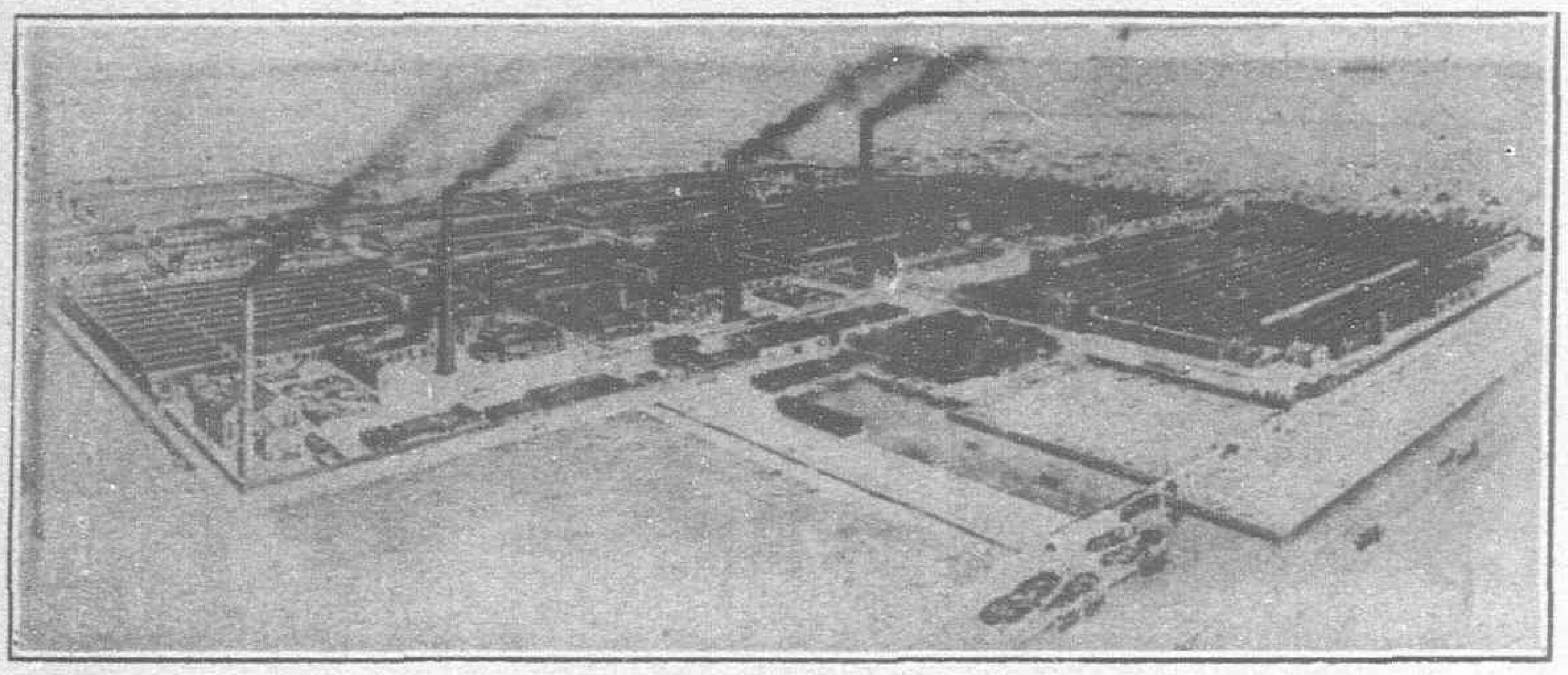
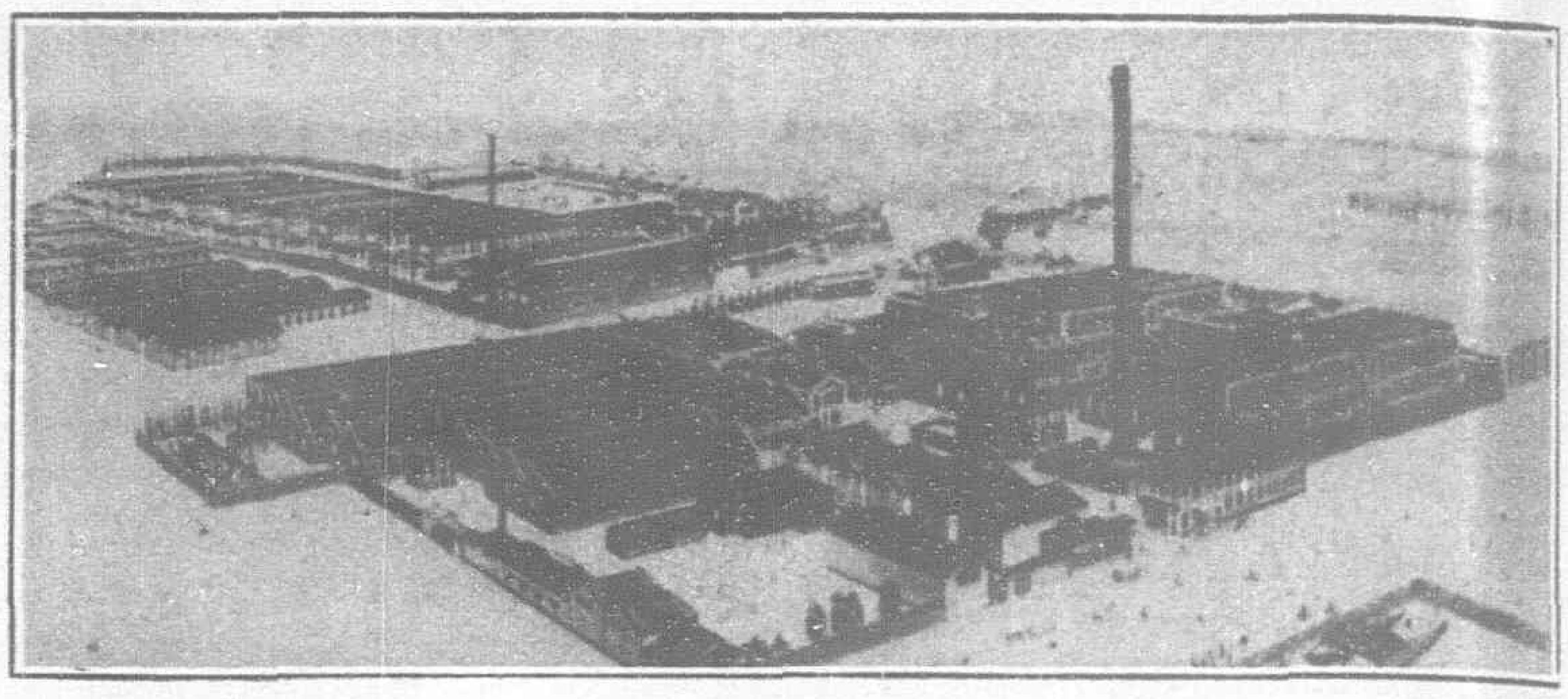
*Report on the Cotton Spinning and Weaving Industry in Japan. By M. W. B. Cunningham, His Majesty's Consul, Osaka. Published for the Department of Overseas Trade by H.M. Stationery Office. Price 3s. net, 3s. 2d. post free.

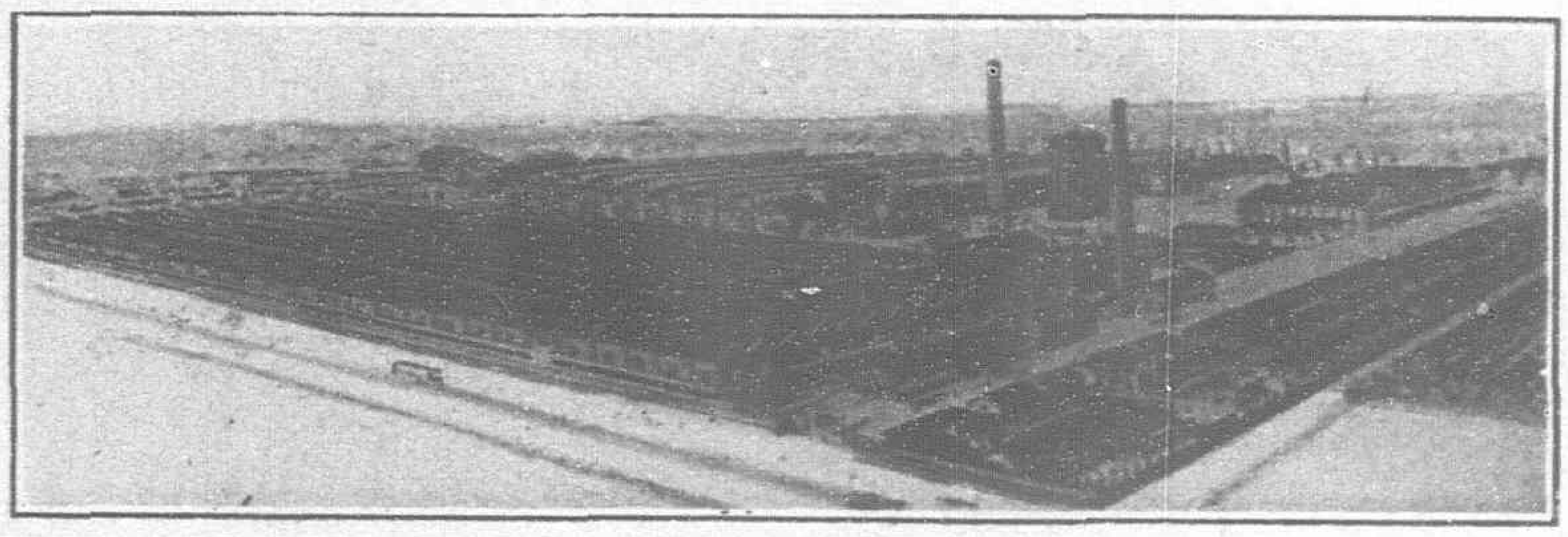


Tsu Factory



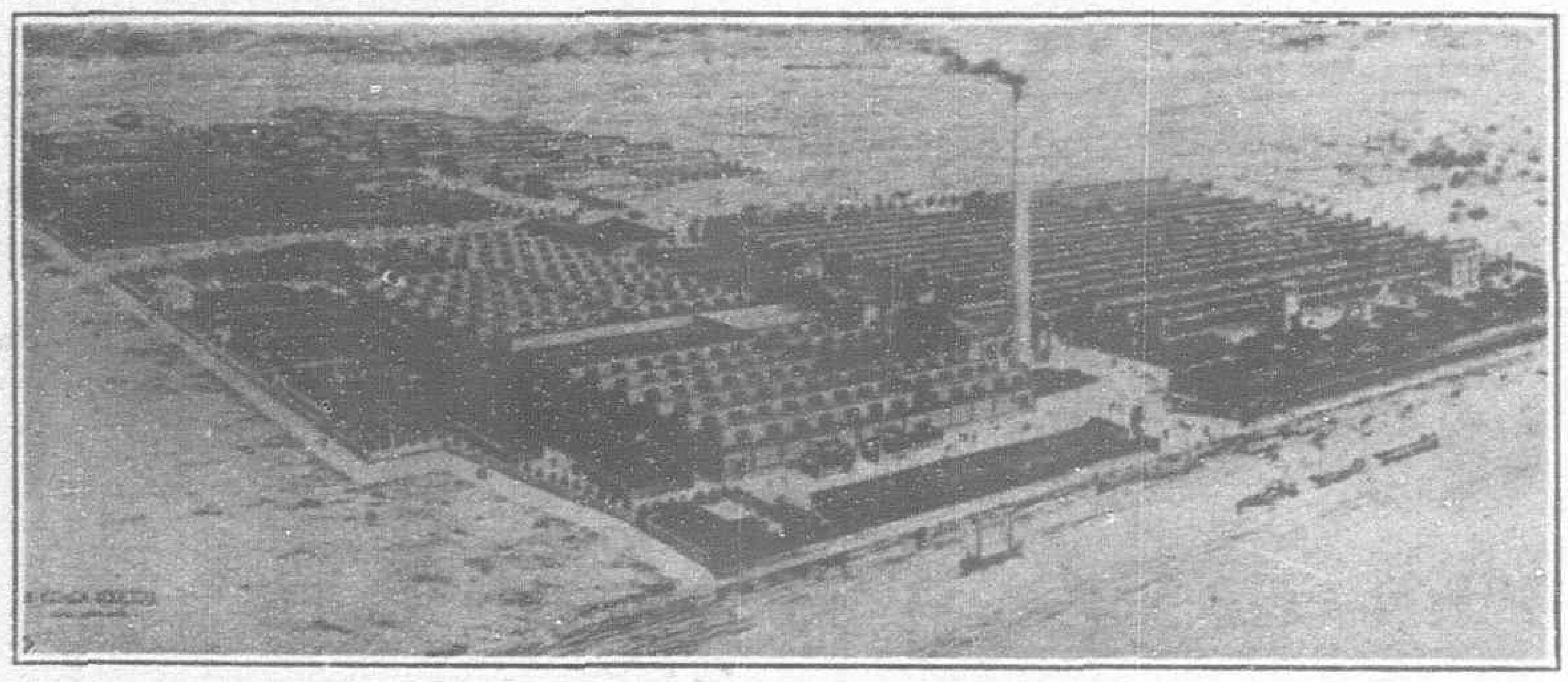
Yokkaichi Factory

gross earnings of the spinning companies amounted in each of the three half-years to over 45 per cent. of their total paid-up capital, while their net profits amounted to nearly 40 per cent,. or more, of the same amount. While, too, the average capital, both authorised and paid up, for each half-year of the five-year period from 1916-20 was only about twice that for the preceding five-year period, the average gross earnings show an increase of as much as 478 per cent. and the net earnings of 544 per cent. Further, special attention may also be called to the very large sums written off for depreciation of buildings, etc., during the years 1916-20, the average per half-year for the five-year period in question having been as much as 6.8 per cent. of the average value of the fixed assets for the same period, as compared with an average of about 2 per cent. only for the period from 1911 to 1915 and a similar figure for that from 1921 to 1925. The larger companies were mainly responsible for this, further mention of which will be found later on in Mr. Cunningham's Report.



Aichi Factory

This prosperity was almost entirely due to the extraordinary expansion that took place in Japan's trade in cotton piece-goods as a result of the opening up of new markets during the European war. Japanese manufacturers were not slow to see their opportunity, and, when they found that they could ship their products to countries whose needs had hitherto been supplied chiefly by the United Kingdom, they did all in their power to secure a footing in those markets. They had already to a certain extent captured the China market, except in so far as goods of supeior quality were concerned. The war allowed them to enter other Far Eastern markets, such as India and the Dutch East Indies, as well as Australia and Africa, and they have to a certain extent retained the position they then secured.



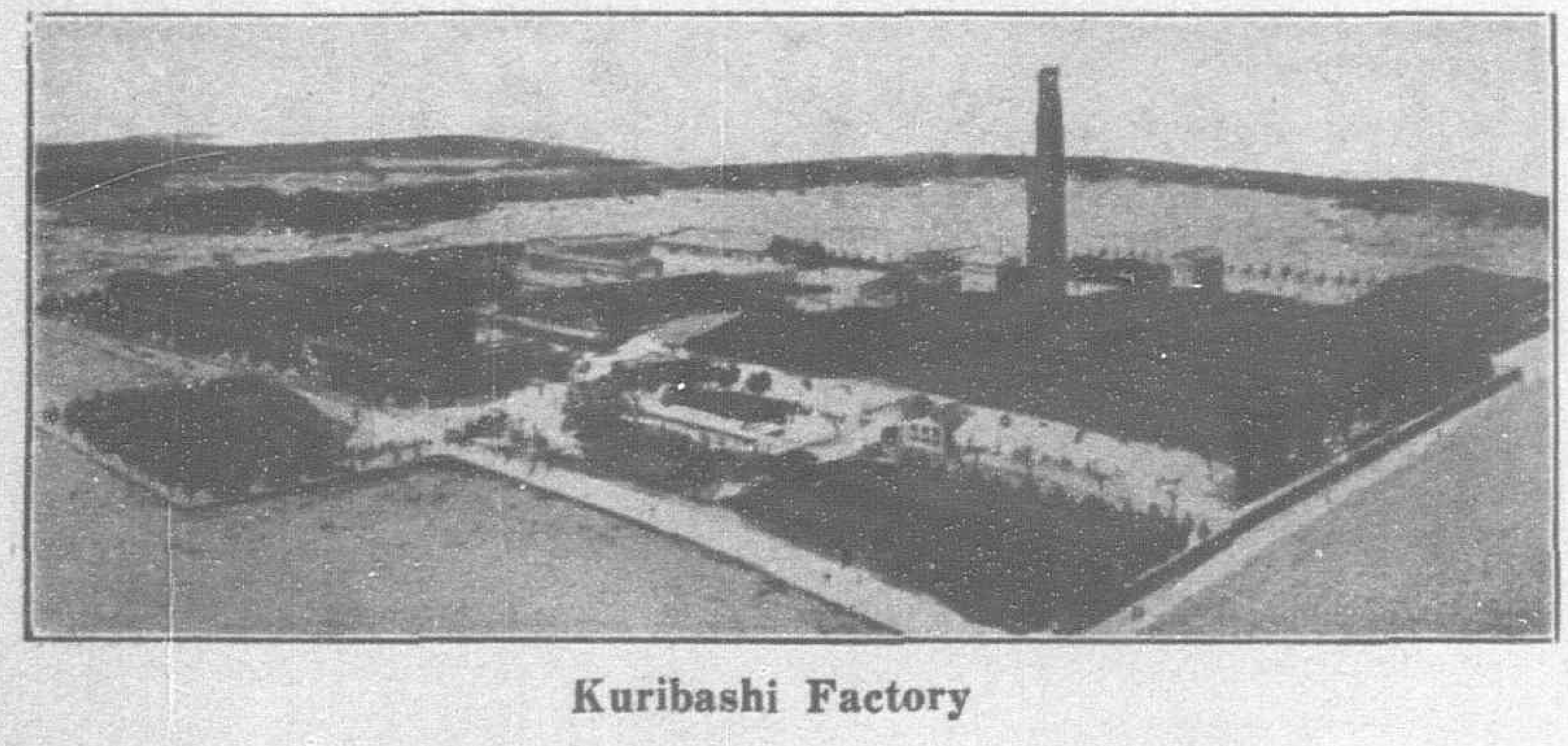
Oji Factory

The extraordinary war-time prosperity of the spinning companies was, however, short-lived, and the second half of 1920 witnessed the end of the post-war boom, the figures given above bearing eloquent testimony to the serious effect the trade depression which set in during the last few months of that year had on the industry. Thanks, however, to the foresight shown during the years of prosperity, the industry is still as a whole in a very strong position.

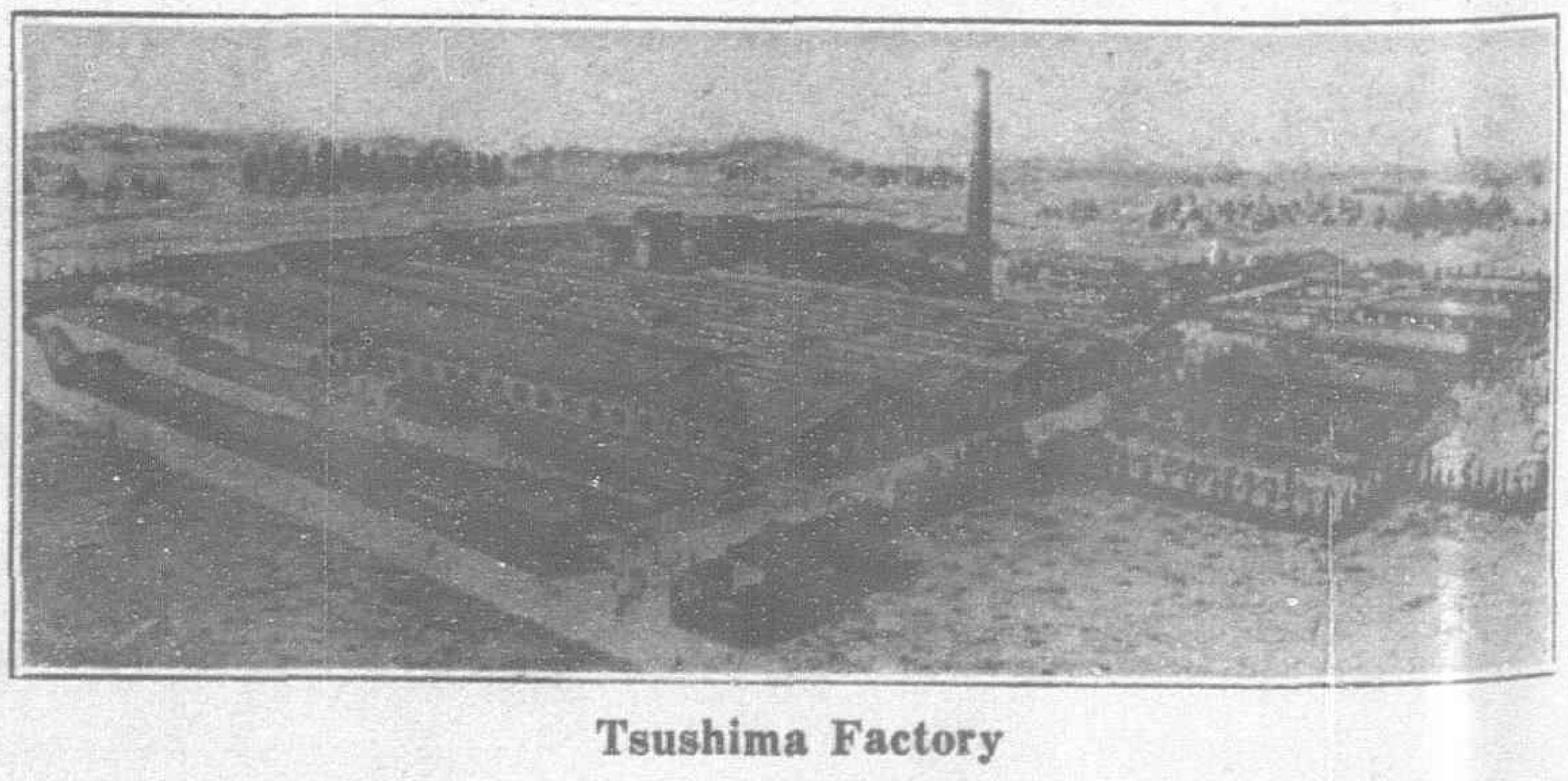
Manufacturing Capacity

The years 1918 to 1922, which, as mentioned above, witnessed the greatest advance in the amount of capital invested in the industry, saw also the most noticeable step forward in the manufacturing capacity of the spinning companies, both as regards spinning and weaving. The increase since in the number of spindles is especially remarkable when it is remembered that, as a result of the earthquake of 1st September, 1923, about 900,000 spindles, or approximately one-fifth of the total number of spindles in the country at that date, were either totally destroyed or temporarily put out of action by the disaster. A rough estimate of the permanent loss of capacity was 500,000 spindles, the company which suffered most heavily being the Fuji Gasu Spinning Company, the largest in the country engaged in the spinning of gassed yarns, whose Oyama mills, at the base of Mount Fuji, were entirely destroyed. The fact that in spite of this blow to the industry as a whole the spinning companies had by the end of 1924 more than made good the losses resulting from the earthquake is a plain indication of their financial strength and recuperative power. The average annual increase in the total number of spindles for the last five years was approximately 274,000, as compared with an average of 201,000 for the preceding five years.

A tabular statement of the number of power looms operated by spinning mills (members of Japan Cotton Spinners' Association) in Japan, with consumption of cotton yarn and production of cotton cloth during the period from 1916 to 1925, shows an average annual increase in the number of looms of approximately 4,000 for the



Kuribashi Factory



Tsushima Factory

period from 1916 to 1920, and of 3,700 for the succeeding five years. As regards weaving companies which are not members of the Association, it is impossible to speak with any degree of certainty, as reliable statistics are not available, and figures published by the Department of Commerce and Industry in Tokio give only the total number of establishments engaged in the weaving of cotton fabrics at the end of 1923 and 1924.

Of the total number of power looms controlled by the Japan Cotton Spinners' Association at the end of 1925, viz., 68,160, rather more than 5,400 are stated to have been for the manufacture of narrow width cloth, so that it is safe to assume that the members of the Association operate approximately half of the wide looms (for cloth of more than 15 inches in width) in the country. The narrow looms referred to are, moreover, all operated by five small and relatively unimportant companies.

Conclusion

The foregoing notes in regard to the cotton spinning and weaving industry in Japan will, it is hoped, serve to make clear the general position at the present time. The total number of working spindles in Japan at the end of June last is given as 4,950,000, an increase of about 200,000 as compared with the previous half-year. The rate of expansion in manufacturing capacity was well maintained; the larger companies paid the same rate of dividend for the first term of 1926 as they had done for the previous business period, and it may be said that on the whole the industry has continued to prosper.

It seemed probable that the close of the year would see an increase of approximately 300,000 spindles as compared with the end of 1925, and it is estimated that by the end of 1928 or the middle of 1929, when the revised factory regulations take full effect, the additional spindleage will not fall far short of a million spindles. And in this connection it may be of interest to cite the opinion of Dr. Kikuchi, President of the Dai Nihon Company, and one of the most prominent men in spinning circles in Japan, who, in conversation with Mr. Cunningham, expressed the view that, while the Japanese spinning industry can, by increasing the efficiency of its plant, to some extent at least provide for the loss in production which must be expected in 1929, this cannot be done by these means alone. A higher rate of increase in the number of spindles in use in Japan must therefore be anticipated during the next few years.

At the same time the opinion is freely expressed, and the fact fully realised, that increased competition must be anticipated from mills in China. Information in regard to the quantity of yarn and cloth produced by mills in that country is lacking, but it is stated that the number of mills had risen from 31 with 1,009,000 spindles and 4,564 looms in 1915 to nearly 3,500,000 spindles with 22,924 looms at the end of 1925, a development more remarkable than that of the Japanese industry itself during the same period. The production must, therefore, be considerable, and, to quote Dr. Kikuchi again, is likely to increase to such an extent that, provided only conditions in the country become more settled, Japan is bound ultimately to lose her present supremacy in this market. She is, in fact, in much the same position as regards competition with China as the United Kingdom found herself in when the effect of the development of the industry in Japan was first appreciably felt. The country is still far less developed than Japan, and the standard of living is much lower, while Japan, on the otherhand, is approaching nearer and nearer to western standards in this respect.

An extension of the existing Japanese mills in China may be expected as soon as conditions improve. The Japanese spindleage and loomage is already considerable (1,303,806 ring spindles, 3,000 mule spindles, 64,000 doubling spindles, and 6,944 looms at the end of 1925), and it is understood that a certain amount of attention is even now being paid to the production of medium counts. For the present, however, conditions are too unsettled for any new plans to be made, especially as many of the mills have already suffered severely from the labour troubles which have prevailed since the summer of 1925. There is all the more reason, therefore, for the industry in Japan to endeavour to consolidate as far as possible the position it has already attained, and it is not surprising to find that the Japanese are doing all in their power to extend their market in other countries. During the past few months several semi-official missions have been dispatched to various parts of the world with samples of Japanese goods of all kinds, including yarns and cloth, and there can be little doubt that the next few years will see redoubled efforts in this direction. The Japanese are a highly ambitious people, and, having rendered themselves practically independent of foreign countries as regards their requirements of cotton goods, intend to have as large a share as possible of the trade in this direction in other parts of the world. Increased competition from Japan in cotton goods of all kinds, especially finished cloth, most therefore be anticipated.

Japan's Production and Exports of Cotton Yarn and Cloth

In 1925 the mills belonging to the Japan Cotton Spinners' Association reported a record production of 2,436,758 bales (974,714,000 pounds) of cotton yarn and 1,179,525,000 yards of cotton cloth, compared with 905,536 bales (362,214,400 pounds) and 114,908,000 yards, respectively, in 1905—an increase in the 20-year period of 169 per cent in the output of yarn and of 926 per cent in the production of cotton cloth. The mill consumption of raw cotton rose from 846,581 bales (500 pounds each) in 1905 to 2,250,413 in 1925—a gain of almost 166 per cent.

Further Advance Indicated for 1926

Data for the full year 1926 will not be available for several months, but preliminary figures for the first nine months, compiled from the monthly reports of the Japan Cotton Spinners' Association, show a total cotton consumption of 1,815,496 bales and a production amounting to 1,938,591 bales (775,436,400 pounds) of cotton yarn and 950,006,000 yards of cotton cloth—increases of 10.7 per cent in cotton consumption and of 8.7 per cent and 9.2 per cent, respectively, in the output of yarn and cloth compared with the first three quarters of 1925.

Preliminary figures, received by cable, show a total yarn production by these millls of 443,000 bales (177,-200,000 pounds) during October and November, 1926, as against 431,516 bales (172,606,400 pounds) spun during the corresponding months of 1925. These statistics indicate that the total output of yarn and cloth in 1926 will equal if not exceed the high record of 1925.

Cotton Yarn Exports Decline in 1926

Settsu Mill of the Settsu and Amagasaki Cotton Spinning Co., Ltd.

Japan's exports of cotton yarn amounted to approximately 294,000 bales of 400 pounds each in 1925, compared with 264,000 in 1924 and an average of 292,154 for the 10 years 1904 to 1913, inclusive, and an average of 405,530 for the years 1914 to 1923, inclusive, according to statistics published by the Japan Cotton Spinners' Association. The 1925 shipments closely approximated the prewar average but fell considerably below the average for 1914 to 1923, which included heavy exports during the war period. During the years 1914 to 1918, inclusive, Japanese exports of cotton yarn fluctuated between 420,000 and 575,000 bales.

During the first nine months of 1926 Japanese exports of cotton yarn totaled almost 154,000 bales, or approximately 62,000 less than shipments during the corresponding period of 1925. Marked fluctuations occured in the quantity exported month by month, shipments ranging from 10,658 bales in Jaunary 1925, to a peak of 42,921 bales in June of that year. Recessions and recoveries in the amount shipped were features of the balance of the 1925 trade, but the highest figure, 31,934 bales, was attained in October. March was the best month in 1926, with exports totaling 26,098 bales. A decline set in during June, and exports were down to 7,634 bales in August. Subsequently, a steady recovery took place, with shipments aggregating 12,382 bales in September, 15,783 in October, and about 17,000 in November.

Cotton Consumption and Yarn and Cloth Production

The consumption of raw cotton, the monthly average of active cotton spindles, and the production of cotton yarn and cloth, as reported by the mills belonging to the Japan Cotton Spinners' Association, are given in the following table for the calendar years 1905 and 1913 to 1925, inclusive, and the first nine months of 1926 :

Japanese consumption of raw cotton and mill production of cotton yarn and piecegoods.

Year	Cotton consumption			Active spindles (monthly average)	Production	
	American	Indian	Total		Yarn	Cloth
	—	—	—	—	—	1,000
	Bales	*Bales*	*Bales*	*Number*	*Bales*	*yards*
1905 ...	248,558	431,062	846,581	1,329,404	905,536	114,908
1913 ...	404,882	869,371	1,424,277	2,167,926	1,517,982	416,725
1914 ...	340,795	1,099,737	1,567,715	2,369,801	1,666,181	454,902
1915 ...	418,071	1,118,641	1,615,642	2,463,376	1,720,264	502,077
1916 ...	471,231	1,187,956	1,791,174	2,757,299	1,925,753	560,181
1917 ...	484,289	1,181,042	1,811,887	2,850,637	1,923,841	594,649
1918 ...	560,749	906,145	1,706,456	2,936,495	1,803,866	656,935
1919 ...	711,178	753,297	1,795,107	3,179,568	1,920,782	739,390
1920 ...	620,740	965,763	1,704,633	3,191,753	1,816,976	762,037
1921 ...	609,527	1,043,997	1,721,093	3,162,353	1,811,350	700,698
1922 ...	779,518	1,230,484	2,095,759	3,967,265	2,228,246	869,328
1923 ...	592,847	1,305,597	2,039,405	4,079,855	2,171,153	1,000,709
1924 ...	564,394	1,127,938	1,938,027	4,115,692	2,072,817	1,030,906
1925 ...	—	—	2,250,413	4,669,753	2,436,785	1,179,525
1926 (first 9 months)	—	—	1,815,496	4,972,721	1,938,591	950,006

Note.—Cotton consumption in bales of 500 pounds ; yarn production in bales of 400 pounds.

Export Markets for Japanese Cotton Yarn Located in Far East

China and British India are by far the most important export outlets for Japanese cotton yarn. In 1925 China took 134,344 bales of cotton yarn, of which 42,234 bales were 20s, 31,995 were 32s, and 40,681 were in counts of 40s and upward. Its purchases declined during the first nine months of 1926 to 58,941 bales as against 103,000 bought during the corresponding period of 1925. Over 60 per cent of Japan's 1925 exports to British India consisted of 42s. Sales of yarn to India during the first three quarters of 1926 totaled 51,653 bales, or about 6,000 less than during the like period of 1925.

The monthly reports of the Japan Cotton Merchants' Union show the exports of cotton yarn by counts to the principal countries of destination. These figures check very closely with official Japanese export statistics and with those published by the Japanese Cotton Spinners' Association. The following table is based upon the reports of the union :

Japanese exports of cotton yarn by counts, to the principal countries of destination

[Quantity in 400-pound bales]

Country of destination	14s and under	16s	20s	32s	*40s and 42s	43s and above	Total
1925 (calendar year) :							
China	1,810	17,624	42,234	31,995	37,593	3,088	134,344
Hongkong... ...	4,243	647	31,368	5,996	12,259	330	54,843
Philippine Islands	167	156	1,196	392	386	239	2,536
British India ...	139	232	10,369	11,220	48,909	9,541	80,410
Other countries ...	1,075	1,338	11,271	520	6,726	846	21,776
Total	7,434	19,997	96,438	50,123	105,873	14,044	293,909
1926 (first 9 months) :							
China	345	1,951	11,190	18,540	23,810	3,105	58,941
Hongkong... ...	2,702	920	12,558	1,116	5,633	180	23,109
Philippine Islands	19	30	1,812	290	157	158	2,466
British India ...	127	71	2,604	6,386	32,109	10,356	51,653
All other	895	565	10,807	496	4,101	221	17,085
Total	4,088	3,537	38,971	26,828	65,810	14,020	153,254

*42s only in 1925.

Yarn Consumption and Cloth Production Increase

Despite increased production and declining exports of cotton yarn in 1926 as compared with 1925, stocks of cotton yarn in the warehouses and sheds at Kobe and Osaka were actually lower at the end of each quarter in 1926 than in 1925. A small quantity of cotton yarn is warehoused in Tokyo where stocks showed a tendency to accumulate during 1926. The quantity involved, however, is comparatively unimportant, stocks having totaled 3,314 bales at the end of August, 1926. The decrease in exports was largely offset by increased consumption of yarn in the weaving establishments of the Japanese Cotton Spinners' Association. The amount of yarn consumed by the mills during each quarter of 1926 exceeded the quantity used during the corresponding period of 1925.

Coincident with the increase in consumption of cotton yarn were parallel gains in the output of cotton cloth. During the first nine months of 1926 the mills wove 950,006,000 yards of cotton cloth compared with 870,046,000 in the first three quarters of 1925. Of these amounts, 709,945,000 yards, or 74.7 per cent, were exported in 1926 and 684,906,000 yards, or 78.7 per cent, in 1925. Despite this favorable showing, exports of cotton cloth recorded a sharp decline from 241,291,000 yards in the June, 1926, quarter to 202,835,000 in the September quarter. October shipments, however, amounted to 79,806.000 yards, or approximately 3,000,000 less than those of the corresponding month of 1925, and probably presage a further recovery in cloth exports during the balance of 1926.

Stocks of Cotton Cloth Accumulating in Kobe and Osaka Markets

In consequence of the slump in exports, stocks of staple cotton fabrics have been accumulating in Kobe and Osaka and at the end of September stood at 95,800 bales, or 37,000 more than on September 30, 1925. Commenting on this phase of the situation, the Japan Financial and Economic Monthly for September, 1926, states :

Exports of cotton fabrics so much prospered in March, 1926, that they exceeded 100,000,000 yards, the highest record known for the past. But from the following month they gradually declined until they decreased to a level of 63,000,000 yards in August, having decreased by as much as 40 per cent during the five months. Cotton-yarn exports have pursued almost the same course as cotton fabrics, dropping from 26,098 bales (400 pounds each) in March to 7,634 in August. This serious depression in exports of cotton yarn and cloth is due chiefly to the recovery of exchange. It has also recently been accounted for in no small degree by the high price in the domestic market.

As will be seen from the accompanying table, stocks of cotton fabrics have, on the whole, been on the increase since the beginning of 1926. While in 1925 the stock declined in the latter half of the year, the reverse is likely to be the case in 1926. Stocks at the end of August, 1926, were as large as 91,000 bales, an increase of 33 per cent over the figure of August, 1925. Besides this stock on the market, there is said to be a considerable amount of cotton cloth kept in the godowns (warehouses) of the mills—no less than 100,000 bales. The actual stock accumulated throughout the whole country perhaps exceeds the 200,000-bale mark. It is two to three times the figure for 1925. This oversupply of cotton-cloth stock is due chiefly to the depression in exports.

The increase in production and the collapse of the market have been prominent features of the cotton trade since last year. There may be mentioned various causes such as the increase in exports accompanying the low exchange and the lowering of cost consequent upon a decline in the price of raw cotton. But the fundamental cause must be sought in the decline in the price due to the increase in production. In other words, it is due to the marked falling off in price that consumption both at home and abroad has so much increased that there has not been overproduction of yarn despite the expansion of production.

Data for Japanese Cotton Industry Summarized

The following table shows the production of yarn and cloth by the mills belonging to the Japan Cotton Spinners' Association, yarn consumption, cotton yarn and cloth exports, and stocks in the warehouses and sheds at Kobe and Osaka :

Japanese production and exports of cotton yarn and cloth by quarters and stocks of yarn and cloth in Kobe and Osaka at the end of each quarter

Quarter	Yarn production		Yarn consumed in weaving		Yarn exported	
	1925	1926	1925	1926	1925	1926
	Bales	*Bales*	*Bales*	*Bales*	*Bales*	*Bales*
January-March ...	578,349	636,521	157,218	174,641	45,327	64,451
April-June	614,123	678,995	172,116	197,628	101,165	60,003
July-September ...	591,068	623,075	170,544	178,941	69,586	29,343
October-December	653,245	—	183,077	—	77,848	—
Total	2,436,785	1,938,591	682,955	551,210	293,926	153,797

Quarter	Cloth woven		Cloth exported	
	1925	1926	1925	1926
	Thousand yards	*Thousand yards*	*Thousand yards*	*Thousand yards*
January-March	279,664	307,926	201,973	265,819
April-June	302,619	333,977	242,871	241,291
July-September	287,763	308,103	240,062	202,835
October-December	309,479	—	220,433	—
Total	1,179,525	950,006	905,339	709,945

Quarter	Stocks in Kobe and Osaka at end of quarter			
	Cotton yarn		Cotton cloth	
	1925	1926	1925	1926
	Bales	*Bales*	*Thousand yards*	*Thousand yards*
January-March	23,983	16,654	78,932	63,377
April-June	24,362	20,020	105,248	95,182
July-September	22,385	15,163	58,507	95,800
October-December	19,166	—	60,835	—

Source : Statistics for yarn consumed in weaving, production of cotton yarn and cloth, and cotton-yarn exports, from Monthly Reports of the Japan Cotton Spinners' Association ; cotton-cloth exports and stocks of cotton yarn in Kobe and Osaka, from reports of the Japan Cotton Merchants' Union and the Cotton Yarn and Cloth Exporters' Union ; stocks of cotton cloth in Kobe and Osaka, abstracted from an article in the Japan Financial Economic Monthly, September, 1926.

Japanese Exports of Cotton Cloth Increase Slightly in 1926

The total value of Japanese exports of all classes of cotton piece goods increased from 326,587,000 yen in 1924 to 432,850,000 in 1925 (the exchange value of the Japanese yen was $0.4119 in 1924, $0.4104 in 1925, and $0.467 during the first 10 months of 1926). No official data are available showing the quantities of cotton cloth shipped to the various export markets during 1926. The 10-day reports of the Japan Cotton Merchants' Union and the Cotton, Yarn, and Cloth Exporters' Union give fairly reliable figures for the exports of some of the more important classes of cotton piece goods and also the total shipments of cotton cloth to the principal markets. Japanese exports of cotton cloth during the first 10 months of 1926 amounted to 789,752,000 yards compared with 767,648,000 in the corresponding period of 1925, according to the reports of the union. The value, however, declined from 233,056,000 yen in 1925 to 208,007,000 in 1926. Unbleached shirtings, unbleached sheetings, and drills, in the order named, were the most important classes of goods shipped in both 1925 and 1926.

Principal Export Markets for Japanese Cotton Piece Goods

China took about half of the Japanese exports of the classes of cotton picee goods, listed by the union, in the first ten months of both 1925 and 1926. British India ranked second, but its takings were about 34 per cent in 1925 and 40 per cent in 1926 of the Chinese purchases. The Netherlands East Indies, Egypt, Arabian Persia, and the Straits Settlements, in the order mentioned, were other important export outlets for Japanese cotton cloth.

The principal classes of cotton cloth exported and the most important countries of destination are shown in the following table, taken from the aforementioned union report :

Japanese exports of cotton cloth by classes and countries of destination

[Quantities in thousands of yards ; values in thousands of yen]

Classes and countries	10 months ended October 31—			
	1925		1926	
	Yards	Value *Yen*	Yards	Value *Yen*
Unbleached sheetings	148,648	44,759	157,267	43,506
Unbleached shirtings	216,473	69,333	223,951	57,893
Bleached shirtings	47,976	16,610	52,097	15,315
Drills	105,669	33,486	92,611	28,455
Jeans	130,079	41,546	146,243	39,090
Imitation nankeens	67,094	12,984	65,823	10,231
T-cloths	51,709	14,338	51,760	13,517
Total	767,648	233,056	789,752	208,007
Exported to—				
China, including Hongkong ...	395,231	118,007	389,230	94,963
British India	136,055	42,935	156,986	42,759
Netherlands East Indies ...	75,608	23,628	82,887	22,997
Straits Settlements	19,730	6,100	15,846	5,106
Philippine Islands	13,623	4,152	10,476	3,368
Egypt	42,048	12,489	48,681	14,402
Other Africa	20,869	6,417	23,562	6,703
Australia...	7,557	2,198	7,069	2,113
Balkan States	9,837	2,947	12,035	3,395
Arabian Persia	17,872	5,298	20,552	5,674
South America	6,575	2,114	6,793	1,884
Other countries	22,643	6,771	15,630	4,643

Present Situation of the Japanese Cotton Industry

The following analysis of the present position and future prospects of the Japanese industry is a brief digest of a report on the subject by Commercial Attaché C. E. Herring, Tokyo :

The Japanese cotton spinning and weaving industry has been passing through a serious crisis. Current opinion in the trade is that the bottom has been reached but that the upward market tendency in the last week of November may not continue in view of the international situation and other factors involved.

Cotton-yarn prices have reached a new low level during the past two months and some of the mills are said to be in financial difficulties. The industry was already feeling the effects of rising yen exchange, the Chinese disturbances, the operation of labor laws prohibiting night shifts, and the declining purchasing power of Far Eastern markets following the drop in silver prices, when the break in American cotton prices occured.

The mills had not anticipated any such price drop and were caught will stocks purchased at much higher dollar prices when the yen was also considerably farther from par ($0.4985) than during the past few weeks, Stocks of cotton yarn and cloth in the mills and in warehouses increased, and the export trade went from bad to worse. Domestic purchasers hesitated to place orders even at abnormally low prices, hoping for a further decline in quotations, until at the end of September, stocks of cotton fabrics warehoused in the Osaka-Kobe district had reached the unusually high total of 95,800 bales and unsold stocks in the godowns of the weaving mills were also above normal. During October domestic sales were somewhat stimulated by bedrock prices and the threat of heavy curtailment of production, and public warehouse stocks had decreased to 84.447 bales at the end of the month.

From the beginning of the cotton year, August 1, 1926, to the middle of November, Japanese spinning mills had bought about 1,000,000 bales of raw cotton, of which more than half was American, according to the Japan Cotton Spinners' Association. When American prices began to decline the mills continued to buy heavily in order to balance previous losses and the final price break completed their embarrassment. Nevertheless, it is predicted by American operators in the Osaka district that total Japanese purchases of American cotton for the 1926-27 cotton year will amount to approximately 1,000,000 bales, about last year's turnover.

The situation of the cotton spinners is far from satisfactory, but there has apparently been considerable exaggeration of their predicament. The fall in prices of American cotton has affected the larger mills, whose resources are greater, more than the smaller mills, as the latter had been buying from hand to mouth before the price break came. Even the larger mills, however, which had purchased three months or more ahead, were somewhat protected by their forward contracts for yarns and fabrics. There has been much talk of production costs exceeding prices, but it appears, in the larger and better equipped mills at least, that such is not the case. While cotton yarn and piece-goods prices in yen have declined, the decrease has been partly offset by the appreciation in the exchange value of the yen.

Japanese textile mills in China are said to have done much better recently than might have been expected considering the disturbed conditions. In fact, the profits of the Chinese mills are relied upon to improve the rather discouraging balance sheets of the parent companies in Japan.

Behavior of Flexible Reinforced-Concrete Mattresses as Bank Protection on Deep Rivers*

Satisfactory Results Obtained in River Work in Japan-Method of Laying Mattresses and Fascines in Deep Water—Experience with Steel Wire for Under-water Work

By B. Okazaki,

Engineer-in-Chief, Upper Liao River Conservancy, Newchwang, China;
Formerly Chief Engineer, Ishikari River Improvement Works, Japan

SINCE the inauguration of the system proposed by the writer fifteen years have elapsed and he is now able to publish the results of the behavior, particularly with regard to durability and final economy, of the works during past thirteen years so as to make those data available for the profession. The following are the data obtained from the example of the flexible reinforced-concrete mattress executed in a deep river, that is, bank protection work applied for the lower portion of the Ishikari River (one of the two largest rivers in Japan draining 6,000 sq. miles) where channel depth in front of natural caving bank varies from 25-ft. to 50-ft. at low water stage while it varies from 37-ft. to 60-ft. in flood time. The total length of the protected banks amounts to 35,982-ft.

As is shown in the accompanying table the original cost of the mattress bank protection work is $6.35 per lineal foot or $33,528 per mile and the repair which is done simply by adding a certain amount of new mattress to the width of the mattress originally laid so as to suit the after scour of the river bed costs 15 cents per year per lineal foot or $792.00 per mile.

During the years, 1910 to 1922, inclusive, 303,149 sq. yd. of concrete mattress have been applied, the first cost of construction being $1.98 per sq. yd. and the total cost of works amounting to $300,000 in round number.

In investigating what will be the actual annual cost of maintaining the river bank (including original cost and repairs), optionally a term of 20 years (assumed probable durability of the mattress) was adopted as the standard from which the average of both the annual allotment of the first cost and the cost of maintenance and repair per foot of river bank protection works are to be calculated. The interest is not considered, as the works were built and maintained by government funds. The sum of the annual allotment of the first cost of construction and the cost of maintenance and repair is found to be 46.8 cents per foot, and is put in the last line of the table so as to make those items and figures comparable with those already itemized in the table in the issue of October 17, 1918, of Engineering News-Record, to the effect that with the concrete mattress the cost of annual repair is usually within the sphere of about 50 per cent of the annual allotment of the first cost of construction while with other types the repairing expense far exceeds the cost of first construction.

For the sake of comparison the items concerning the bank protection works of the wharf front at Yingkow, a town situated 14 miles above the mouth of Liao River in Manchuria, China, are inserted in the last column of the table. Here several mixed systems of revetment works are applied, consisting of wooden crib works, fascine mattress, rubble stone pitching, riprap, heavy plank walls and pileworks to the effect that, even with the type of bank revetment which is made of rather heavy and quite expensive construction the cost of repair and maintenance is quite high as the table shows.

These works in Liao River had been tried by the Russian authorities at first, succeeded by the Japanese concerns since 1905. The lapse of 20 years is valuable in making comparison between the behavior of the flexible concrete mattress and that of other types with particular regard to the cost of protecting the bank of a rather large river.

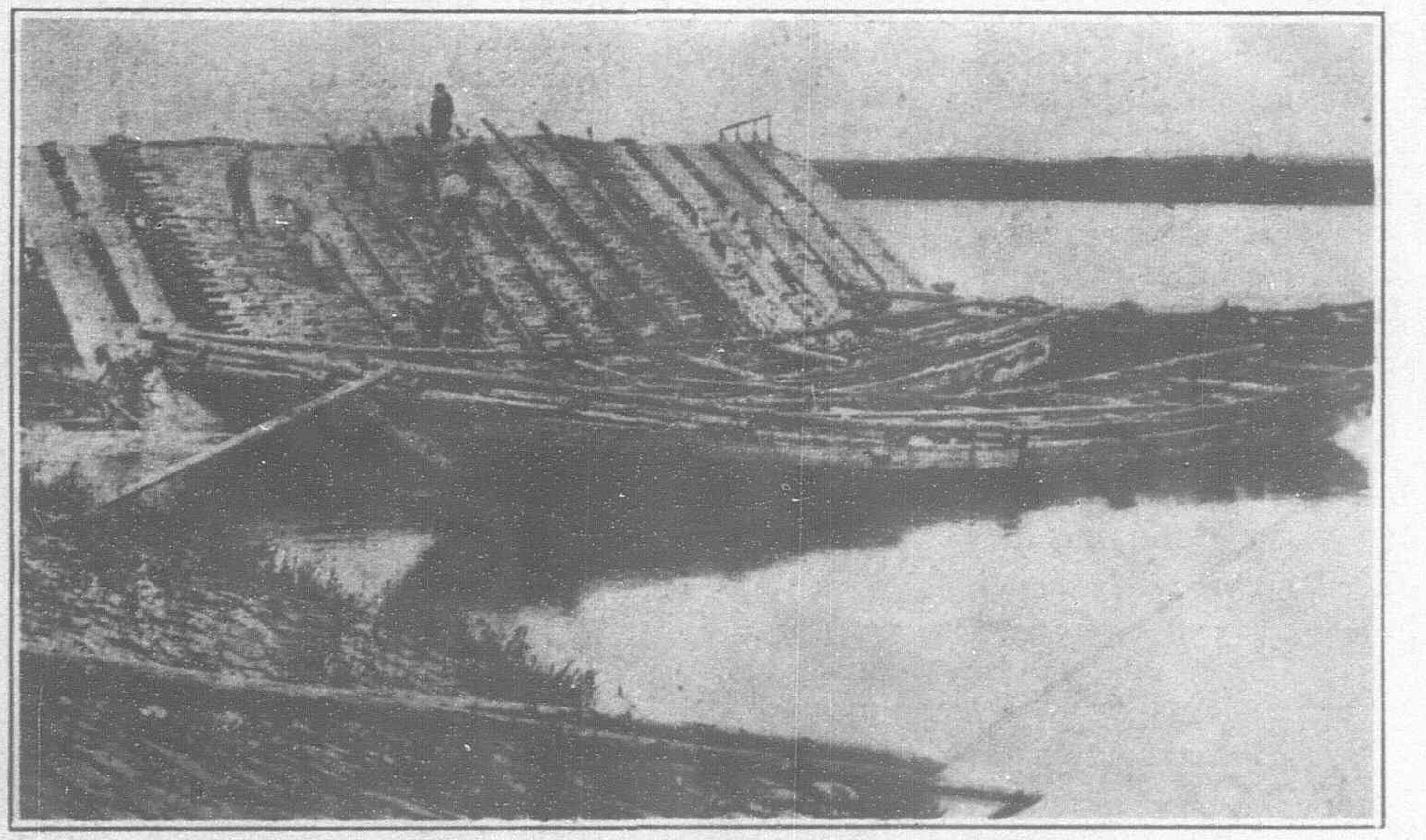
Since the writer's earlier articles were published in that journal he had been requested frequently by the readers of the journal to describe the arrangement adopted by him for laying the flexible concrete mattress with its underlining fascine mat in deep channel separately from the mattress directly laid upon the bank slope and also to give an opinion about the durability of woven wire. Consequently an illustration of the apparatus used for that purpose and conclusions from the experience concerning durability of the wire are added here. The flexible reinforced-concrete mattress was described in Engineering News in May, 1912.

SUMMARY TABLE.

Name of River	Ishikari	Liao River
Locality	Ishikari River mouth —Bitoi	14 miles above mouth
Depth of thalweg at low water stage in ft.	50—25	30—50
Flood height above low water in ft.	10—12	8—15
Method of construction	Flexible reinforced-concrete mattress with lining of single fascine mat.	Mixed type of fascine mattress, wood crib works, rubble stone pitching, rip raps, plank walls and pile works.
Length of works in ft.	35,982	10,866
	U. S. Dollars	U. S. Dollars
First cost of construction per ft. run	6.35	20.47
Annual cost of repair ft. run	.15	1.135
Allotment of the first cost per ft. run in 20 years	.318	2.047
Sum of allotment and annual cost of repair per ft. run	.468	3.182

Underlining Mat for Concrete Mattress—For a river having a sandy bottom such as in the lower reach of Ishikari River we usually add a layer of underlining fascine mat 3-in. thick woven with galvanized wire from the start to prevent direct action by the current in attacking the bottom soil through interstices of the mattress. The practice of putting, simultaneously, the mattress and also the underlining mat in 40-ft. or more of deep water may be described as follows: The mattress is put in deep water of any depth in an unlimited length along the river and with any required width, and independently of the mattress directly laid on the bank slope,

(Continued on page 166)



Laying Continuous Mattress in Deep Water

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*Engineering News Record

Osaka Builds Movable Weirs

Plan to Facilitate Drainage of Minor Branch Streams Running Through Centre of the City

By Eisaburo Kusano

THE Osaka Municipality is now erecting movable weirs at various parts of the city for the betterment of the drainage of minor branch streams running in the centre of Japan's "Water Metropolis." The water level of the main streams, the Dojima-gawa and the Tosabori-gawa, having become lower, the quantity of the water running at minor branches has greatly decreased. So much so that the drainage is in an undesirable condition to such an extent that something must be done.

With this in view, it has been decided that the running water of the main streams be restricted so that a portion of it be directed through the Higashi Yokobori-gawa and Nishi Yokobori-gawa to their branch streams of the Edobori-gawa, Kyomachibori-gawa, Awabori-gawa, Horie-gawa, Nagahori-gawa, Dotombori-gawa, Kozu Iribori-gawa, Namba Shin-kawa, etc., in order that the drainage of these minor rivers be bettered, and incidentally, the navigation be facilitated.

In order to meet the requirement, it has been decided that movable weirs be built in the Dojima-gawa at the upper stream of the Oe-bashi (bridge) and in the Tosabori-gawa, at the upper stream of Higo-bashi in order that an increased quantity of water may flow from these two main streams into the Higashi Yokobori-gawa and Nishi Yokobori-gawa. More movable weirs are to be built at three places, namely, in the Nagahori-gawa at the lower stream of the Yasuwata-bashi, in the Dotonbori-gawa at the upper stream of the Daikoku-bashi, and in the Edobori-gawa in the lower stream of the Edo-bashi.

Lest the navigation on the Dojima-gawa be disturbed while the taintor-gates are all closed down, a lock is under construction ; this lock runs along the side-wall of the embankment of the Dojima-gawa, and by operating it in similar manner as is done at the Panama canal, ships may pass even when the weirs are closed.

"A large number of movable weirs have been built in Japan and abroad in order to facilitate the canalization, or in connection with the hydro-electrical enterprises, but the taintor-gates now being built by the city of Osaka in the Dojima-gawa are unpallarelled in point of its purposes," said Dr. Saburo Okabe, civil engineer, of the civil engineering inspection office of the Department of Home Affairs, who drafted the design of all the movable weirs of the Osaka Municipality.

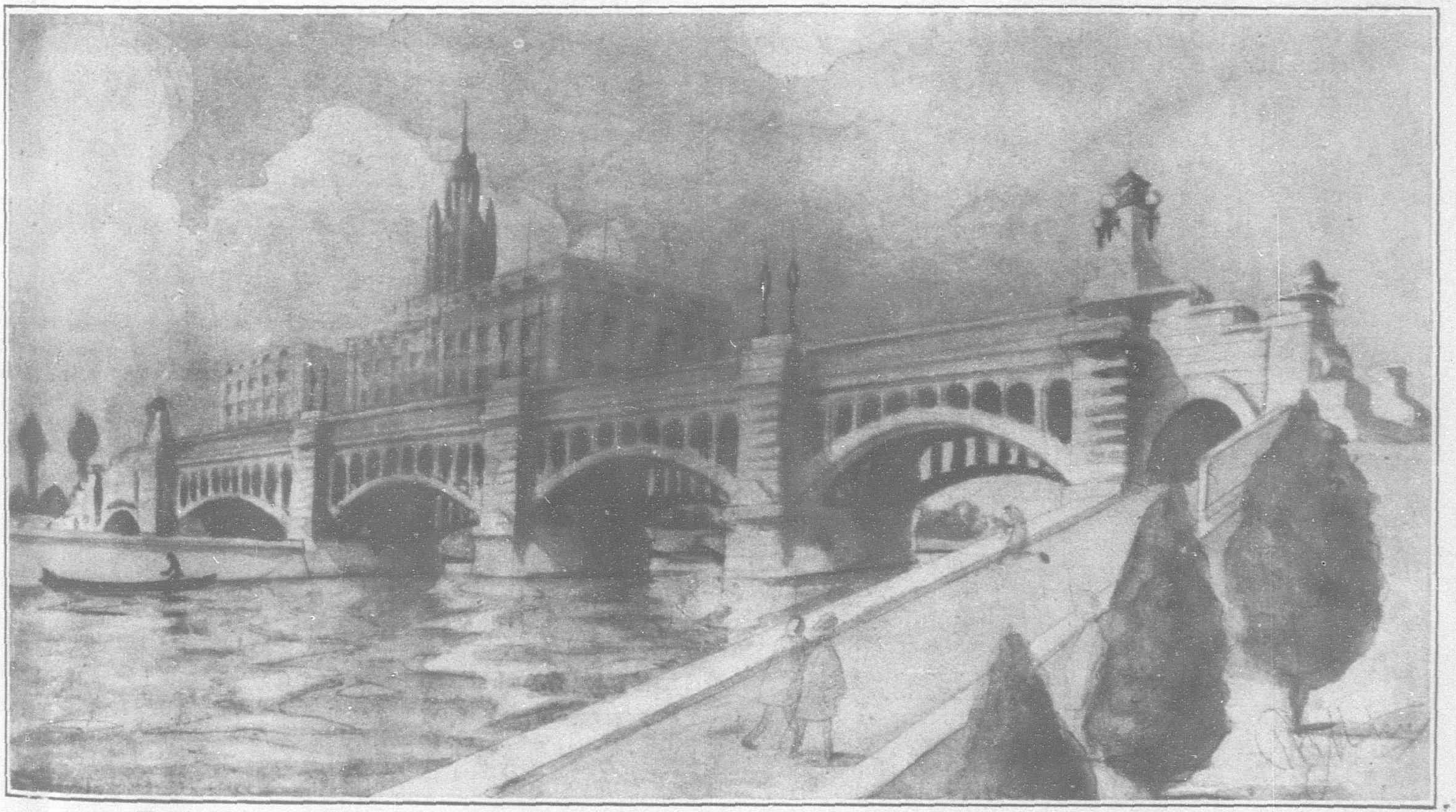
"The striking features of these weirs now either under construction, or proposed to be built, at five places in Osaka are that the movable part of the weirs are almost hidden under the bridge-bed between the arches so that scenic beauty of the city may not be spoiled," he said, continuing : "That the electrically driven taintor-gates take hardly one-minute in the opening and closing, and that gates can be operated by hand when the electric current is temporarily suspended, are also main characteristics of the movable weirs now under construction by the Osaka Municipality."

The following is an outline of movable weirs :

Type of Weirs

There are many types of movable weirs. But Dr. Okabe decided to adopt the taintor-gate in consideration of the following reasons :

(*a*) As the Osaka city's movable weirs are situated in the centre of the city, and also as they are opened and closed both day and night, the general appearance must be pleasant, the operation must be easy, and the time required in the opening and closing must be brief.



The Osaka Municipality started in July, 1926, the construction of a movable weir on the Dojima-gawa (river) with the design drafted by Saburo Okabe, Doctor of Engineering, of the Department of Home Affairs. The main object of the weir is to increase the water of the minor branch rivers running through the centre of the city of Osaka, Japan's "Water Metropolis" so that the drainage be improved, and incidentally, the canalization be facilitated.

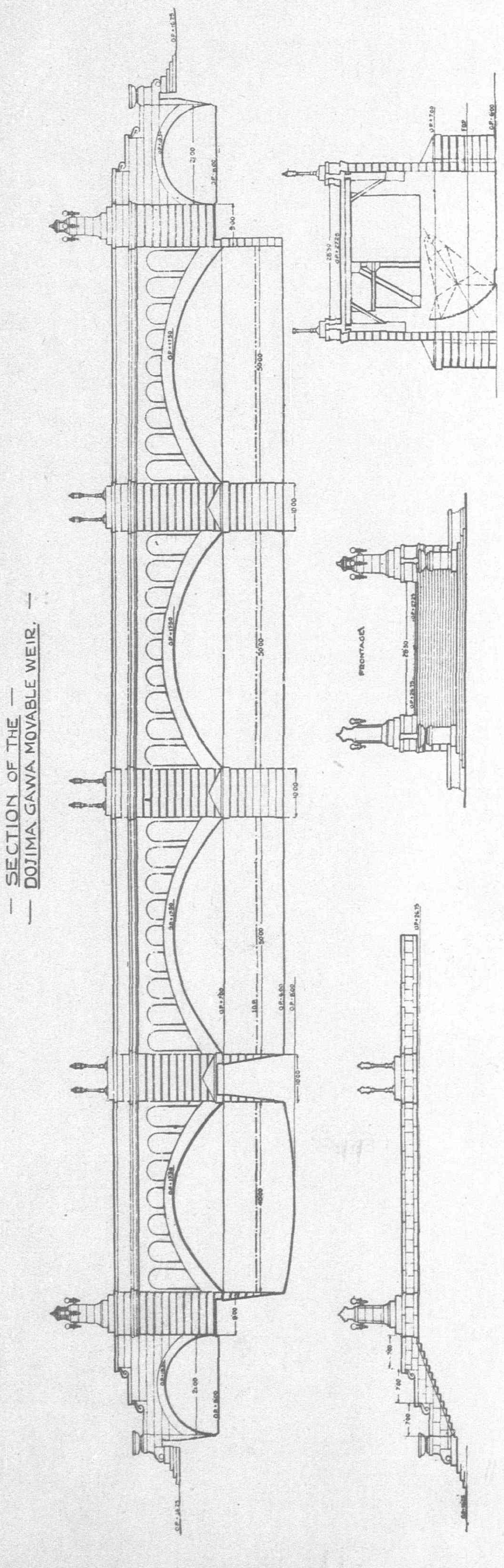
That the movable part of the weir is hidden under the bridge-bed between the arches when they are up, and that the opening and closing of the taintor-gates can be done in a very short time are the two outstanding features of the Dojima-gawa weir.

(*b*) The difference of the water-level of the upper and lower stream on the Dojima-gawa and other streams in Osaka being small, neither sector-gate nor bear-trap dam can be erected in Osaka. It must be selected out of three types, viz., rolling dam, stoney-gate, and taintor-gate.

The rolling dam is rejected because the general appearance spoils the scenic beauty of the city. As regards the stoney-gate, it costs a large amount of money in order to hide the movable part of the weir under the bridge-bed as the bridge must have a considerable height.

(*c*) The construction of the taintor-gate requires a relatively small amount of money, and it serves well the purpose of draining minor branch streams in the city, hence the adoption of this system.

(*d*) The span must be made as large as possible in order that width of the river may not be narrowed down, so that the flood-discharge may easily be disposed of.


— SECTION OF THE —
— DOJIMA GAWA MOVABLE WEIR. —

Dojima-Gawa Taintor Gate

The movable weir now under construction in the Dojima-gawa has three taintor-gates, each one of which is 50 feet by 14 feet. The gate-bed is O.P.—6.00, that is, six feet below low water; the gate-sill is 5.5 feet below low water, and the top of the movable part of the gate is 8.5 feet above high water. The self-weight of the gate is about 20 tons; it is fixed with the same axle with the counter weight so that the operation of the gate may be eased. Both the pier-bed and the weir-bed stand on piles.

Tosabori-gawa Taintor Gate

The size and form of the taintor-gates in this river are same as the Dojima-gawa. The only difference is that the well-sinking system was necessitated on account of the nature of the ground.

Nagahori-gawa Taintor Gate

This movable weir has only one taintor-gate of 50 feet by 13 feet. The construction is about the same as the Dojima-gawa, but the depth of the weir-bed is made 5 feet below low water.

Dotonbori-gawa Taintor Gate

This movable weir has two taintor gates of 50 feet by 13 feet. The construction is about the same as the Dojima-gawa, but the weir-bed is made 5 feet below water.

Edobori-gawa Taintor Gate

This movable weir has one taintor gate of 40 feet by 12 feet.

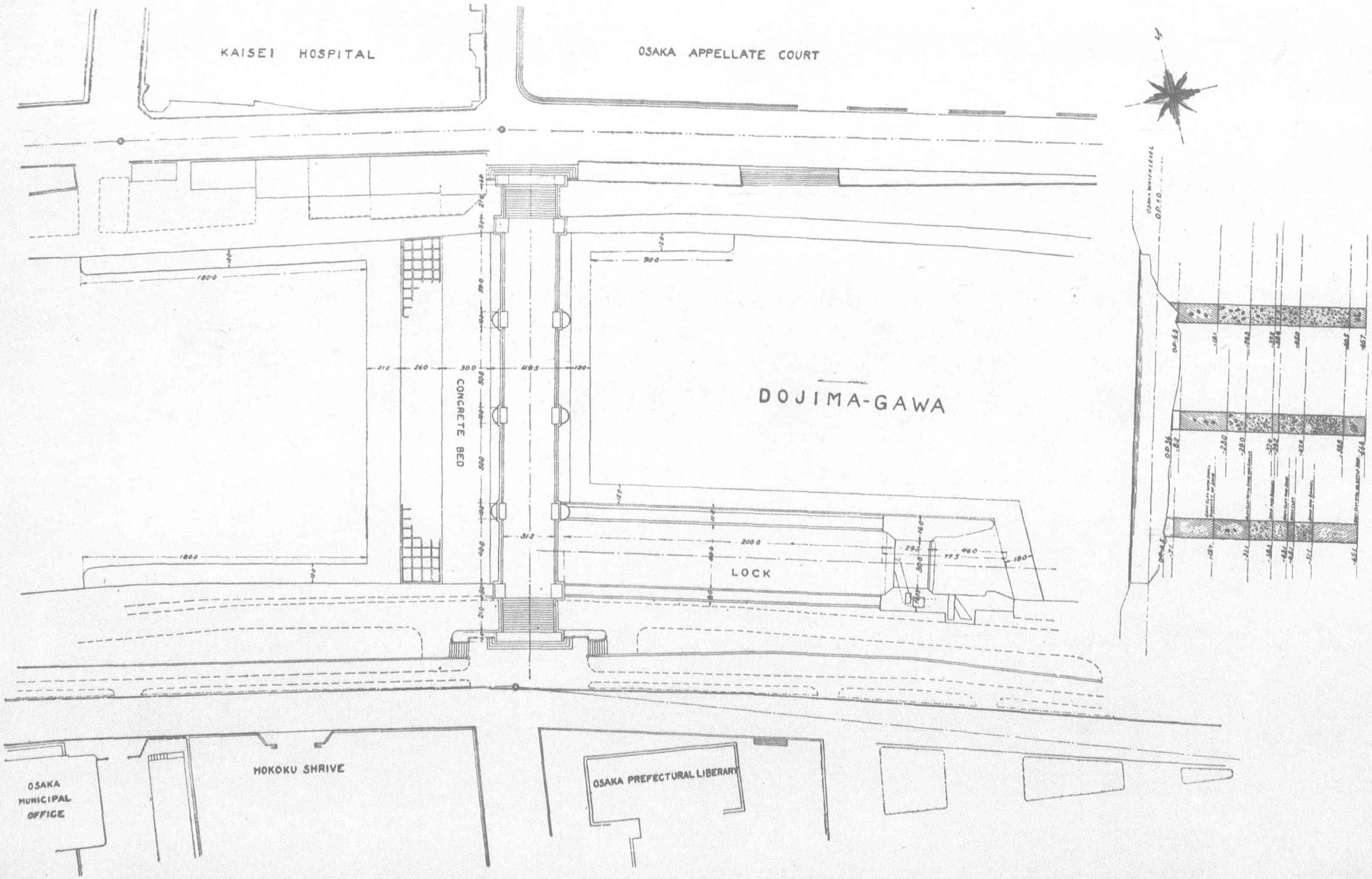
Operation of Gates

In principle, the movable weirs in the rivers in Osaka city are to be left open during the day, and closed only at nights, but a portion of the weirs may be closed even during the day without disturbing the navigation on the rivers. Consequently, at times of low-tide, and when the quantity of water permitted to flow at the Kema lock-gate on the upper stream of the Dojima-gawa, the movable weirs of the Dojima-gawa, Tosabori-gawa, and the Dotonbori-gawa may be partially closed.

When all the gates of the Dojima-gawa and Tosabori-gawa movable weirs are closed at times of high-tide, the water level of the upper streams exceeds 7.5 feet above low water; then, there is possibility of giving adverse effects in the upper stream. With this in view, one of the taintor-gates of the Dojima-gawa and the Tosabori-gawa is equipped with such a device that it automatically opens when the water-level reaches 7.5 feet above low water and it again closes when the water-level become lower than 7 feet above low water. In case the opening of one taintor-gate on the Dojima-gawa and the Tosabori-gawa is found insufficient, more gates may be opened by judgment of the watchmen.

Each one of all the taintor-gates are to be opened or closed by induction motors, and they are operated by hand only when the electric current was temporarily suspended or when the motors are out of order.

The alternative-current induction motor put into operation the shafting which in turn revolves the rack fixed out side of the


KAISEI HOSPITAL
OSAKA APPELLATE COURT
DOJIMA-GAWA
CONCRETE BED
LOCK
1800
900
210
260
300
1195
120
312
200.0
775
460
180
OSAKA WATER LEVEL
O.P.±0.
HOKOKU SHRIVE
OSAKA PREFECTURAL LIBERARY
OSAKA MUNICIPAL OFFICE

counter weight thus opening or closing the gate. It takes one minute when electrically driven.

There are two methods of operating the gates by hand. When necessitated to operate the gate by hand, the clutch is changed, and two men turn the handle thereby operating the shafting which in turn revolves the foregoing rack fixed outside of the counter-weight. It takes about 10 minutes.

If necessary, however, the speed of operating the gates may be doubled, that is, the gates may be operated in 5 minutes by hand, by operating worm-gear.

The electric current is lowered to 220 volts by the transformers fixed at the top of the transmission poles, and it is directed to the controller through the switch-board of the switch-room, and then, it operates the motors. By operation of the limit switch, the electric current is shut off as soon as the opening or the closing of the gate is completed, and simultaneously, the movement of the gates is stopped by magnetic controller.

Warnings to Ships

Blue lamps will be lighted at nights when the gates are all left open, and when they are closed, two red lamps will be lighted above each gate on the bridge in order to give warning to the ships. Just before the gates are put into motion, an electric siren will be blown for one minute, and at the same time, the foregoing two red lamps will be turned on and off alternatively. When the gates automatically open or close, the warning will be given automatically. In preparation for the possible cut-off of the electric current, the switch rooms are equipped with battery for the purpose of operating the warning apparatus.

Outline of Lock

Running along the side-wall of the embankment of the Dojima-gawa, a lock is being built lest the navigation on this river be stopped when the taintor-gates are all closed down. This lock will not be detrimental to the disposal of the flood-discharge as the upper and lower gates may be immediately opened regardless of the difference of the water level at the upper and lower stream of the lock.

The lock chamber is 40 feet wide by 200 feet long; the depth of the centre is 8 feet below low water and that at both sides is 6 feet below low water.

The upper gate is of arch type, having a width of 30 feet with a height of 14.5 feet. There is one sluice conduit, the section of which is 5 feet by 6 feet; a small taintor-gate is used for the sluice valve. The lower gate is a taintor-gate, 40 feet (effective span, 34 feet) by 14 feet, and the bed-sill is 6 feet below low water.

In operating the lock (including the case necessitated in connection with the disposal of the flood discharge), the lower gate (taintor-gate) is closed, and then, the sluice valbe is opened in order to make the water level even with the upper stream so that the upper gate of the lock may be opened. With the upper gate opened and fixed, the lower gate is opened gradually, and thus the upper and lowe gates are simultaneously left open and let the water flow undisturbed.

The outstanding feature of this lock is the adaptation of the taintor-gate for the lower gate so that this may be opened or closed regardless of the difference of the water level of the upper and lower stream.

The opening of the lower gate is done slowly, because if it is done quickly, the water level of the lock chamber sharply decline, when the upper gate is closed, and when the upper gate is left open, and the lower gate is quickly opened, the speed of the water in the lock chamber is animated.

When the contrary-current is created in the Dojima-gawa on account of the high-tide, the lock is out of use, but the quantity of the water in the river, then, will be regulated by the opening of one of the taintor-gates either automatically or artificially, and therefore, there is no need of utilizing the lock. Consequently, whenever the water level of the lower stream becomes same as the upper stream, the lower gate is closed.

The operation of the lock gates are done by the same electric power as the Dojima-gawa movable weirs; the lower gate is operated exactly in the same manner as other taintor-gates, only it takes three minutes. The motors operating the upper gate and the sluice valve are also operated by the controller set up on the operating room on bridge. These gates have automatic limit switch so that the electric current is shut off when the opening or the closing is completed.

The estimated cost of construction of all the movable weirs and the lock is Y.2,070,000.

Behavior of Flexible Reinforced-Concrete Mattresses as Bank Protection on Deep Rivers

(Continued fom page 162).

by using a working or so-called inclined deck pontoon and also weighing pontoons. As shown in the illustration, the underlining fascine mat is knitted on the inclined deck of a big working pontoon capable of accommodating the required width of the mattress. On the finished fascine mat the concrete mattress is knitted and then a certain number of wooden logs, distributed along the length of the mattress, are temporarily and loosely fixed on the mattress by means of free ends of wires previously fixed at certain intervals in order to fasten the underlining fascine mat and concrete mat together. These logs have to be transferred to and hung down from other pontoons, waiting in front of the inclined-deck pontoon, ready to receive the weight of the lowest part of the partially completed mattress in a hanging position, as soon as the lowest part of the mattress is, bit by bit, allowed to slide down along the inclined deck into the water by letting the inclined deck pontoon go downstream gradually to clear the upper portion of the inclined deck of the finished part of the mattress. This makes it possible to continue the operation of extending the length of concrete mattress by working on the cleared portion of the inclined deck.

When the length of the finished extended out portion—that portion of the mattress already taken to and hung from the floating pontoon—is sufficient to reach the river bottom the hanging portion of the mattress is let down gradually so as to lie on the river bottom, by loosening the ropes holding the mattress to the pontoons. When a certain portion of the mattress is thus sunk down to the river bed, and therefore the weighing pontoon is relieved of the weight of the hung mattress, divers are sent down to detach the logs (which are to be used repeatedly), so as to make a weighing pontoon entirely free.

When a weighing pontoon is made free it is again sent downstream and located close in front of the inclined deck pontoon as before to serve for receiving and suspending another charge of the mattress, and the same process is repeated. In the view herewith two weighing pontoons in front of the inclined deck are weighing the finished portion of the mattress while the third pontoon on the right is moving close to the inclined deck in order to be ready to receive the next portion of the mattress, as the construction of the mattress on the inclined deck progresses. By repeating such process the continuous mattress can be set to any length.

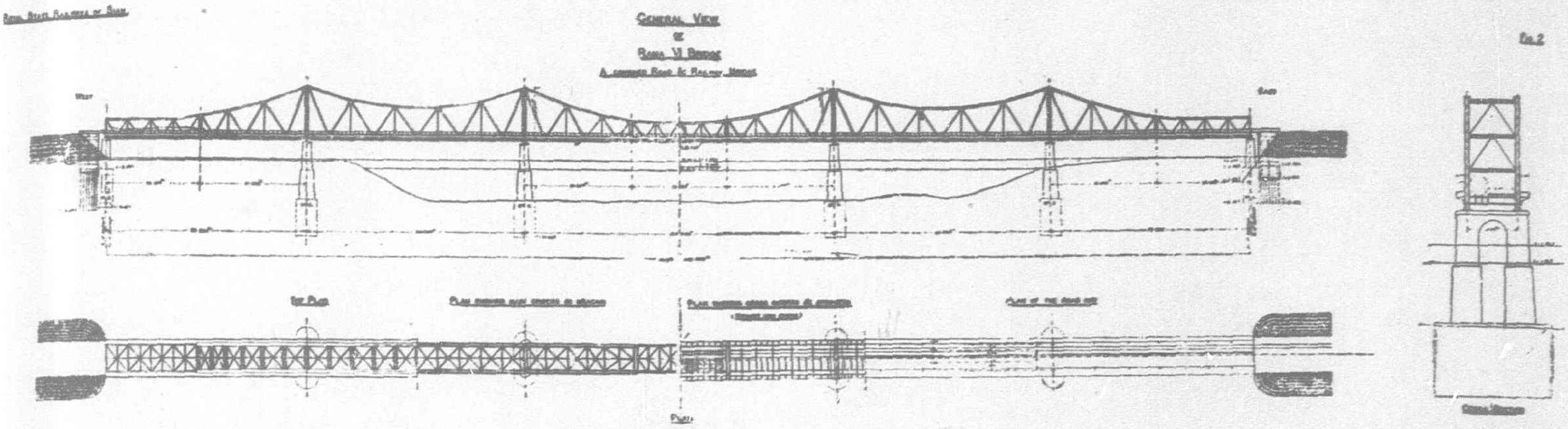
The scaffold was designed by K. Sakamoto, assistant engineer on the Ishikari river improvement works.

This method is used for laying apron mattresses of unlimited length in front of caving banks, and in deep water, so as to protect the foot of the bank protection mattress laid directly on the bank slope when any probable future scour would occur close to the shore. In a river having sandy bottom, as in the Yellow River, it is preferable to provide sufficient width of the apron mattress beforehand than to supplement it afterward.

Making and Sinking Mattress for Bank Slope—To prepare and set the mattress for the underwater portion of a bank slope we usually apply what we call a " pontoon hung log scaffold." This process was fully illustrated in the article of March 13, 1913, and will not be repeated here.

The apron mattress of sufficient width provided beforehand (or afterward, it being optional as to whether the apron or the bank slope mattress shall be laid first) in front of the caving bank in combination with the bank-slope protection mattress may now form a complete bank protection work and requires little after care. Any further scouring may be dealt with by the natural settling down of the protection work to suit the scouring of the bed by making the upper end of the mattress free when first laid to allow it to slide down when threatened from the toe. In other words, we provide no means of checking downward motion of the mattress. The settled or slid down mattress must be supplemented as soon as possible in order to protect the portion of bank slope thus exposed by the settlement of the mattress.

Durability of Wire—In fresh water we use No. 4 galvanized steel wire although copper wire has been used in salt water to prevent its rusting. As to the durability of galvanized steel wire there exists diversity of opinion but in my experience such wire used in the works under my charge in Japan fifteen years ago has not yet suffered appreciably from rusting.

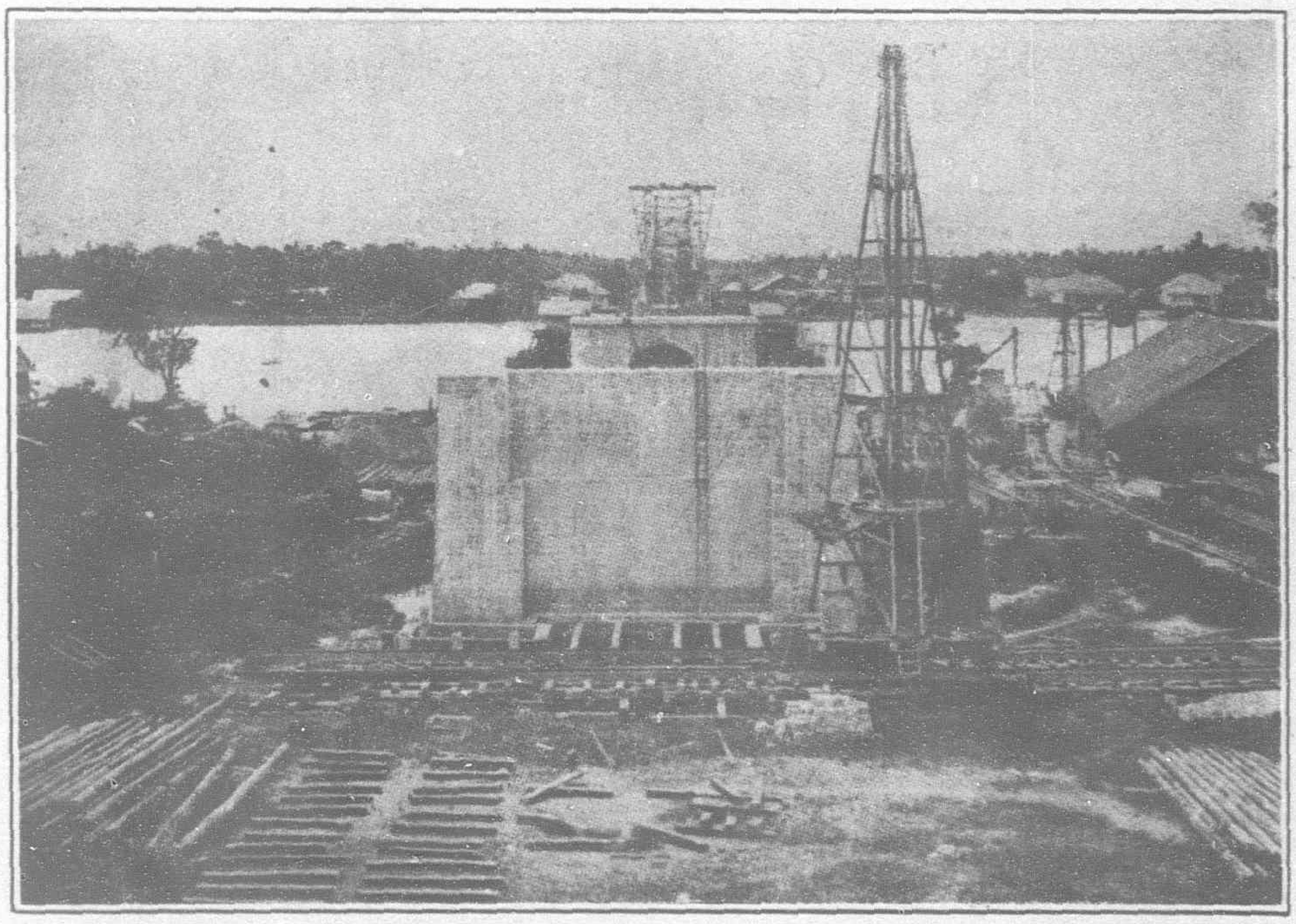

Royal State Railways of Siam
General View of Rama VI Bridge
A combined Road & Railway Bridge
West
East

Rama VI Bridge Over the Chow Phya River at Bangkok

IT was decided in September, 1919 to unify the gauges of the Royal Siamese State Railways by converting the standard gauge lines (1.435 m.) from Bangkok to Chiengmai, Korat and Petriu to metre gauge and further to connect up the Northern and Southern Line systems by bridging the Chow Phya River. When the bridge and connecting line are completed, passengers from the South will come direct into Bangkok Station, instead of to Bangkok Noi as at present, thus doing away with the difficulty of crossing the river by launch or sampan.

Movement of freight will be much accelerated and rolling stock will be available over the whole system instead of being confined to one side or other of the river as at present. Time and money will also be saved by repairing all locomotives, carriages and wagons at the central workshop at Makasan. The connecting link, about 14 kms. in length, branches from the main line to the North at Bangsue Yard, 8 kms. from Bangkok, and joins the Southern Line at a point Km. 6.336 from Bangkok Noi Station.

Borings made at bridge site showed that at a depth of from—14 to—27 m. M.S.L. good hard clays are found, while below—27 m. M.S.L. there is a deep layer of sand. The river at the point of crossing is 300 m. wide.



Looking from Top of West Approach Towards East-West Abutment, in the Foreground

Tenders for the bridge were invited from many well-known firms of contractors and after due consideration the contract was given to Les Etablissements Daydê of Paris. By permission the bridge is called Rama VI after the late King of Siam. The bridge is of the cantilever type with a total length between centres of bearings at abutments of 442.08 m. It is divided into 5 spans, the central one being 120 m. while those on either side are 84 m. The two end spans are 77.04 m. The bridge is 10 m. wide between centres of main girders and consists of a single track railway, a 5 metres roadway and foot-ways 1.50 m. wide on either side, outside the main girders. At present however the roadway, which is on the North, and the foot-way on that side are not built because there is no prospect of a road just yet.

The clearance is 10 m. above mean sea level and 8 m. above maximum flood level, so that ordinary launch and cargo boat traffic can pass safely at all times.

The expansion and contraction due to change of temperature are allowed for by 3 sets of expansion joints on the length of the bridge. The foundations were carried out under compressed air. The abutments were taken down to a depth of—15 m. M.S.L. and the piers to—27 m. M.S.L. The level of the river bed is about—15 m. M.S.L.

The total amount of concrete work in the substructure is 17,433 cubic metres and the total weight of steelwork is 2631 metric tons.

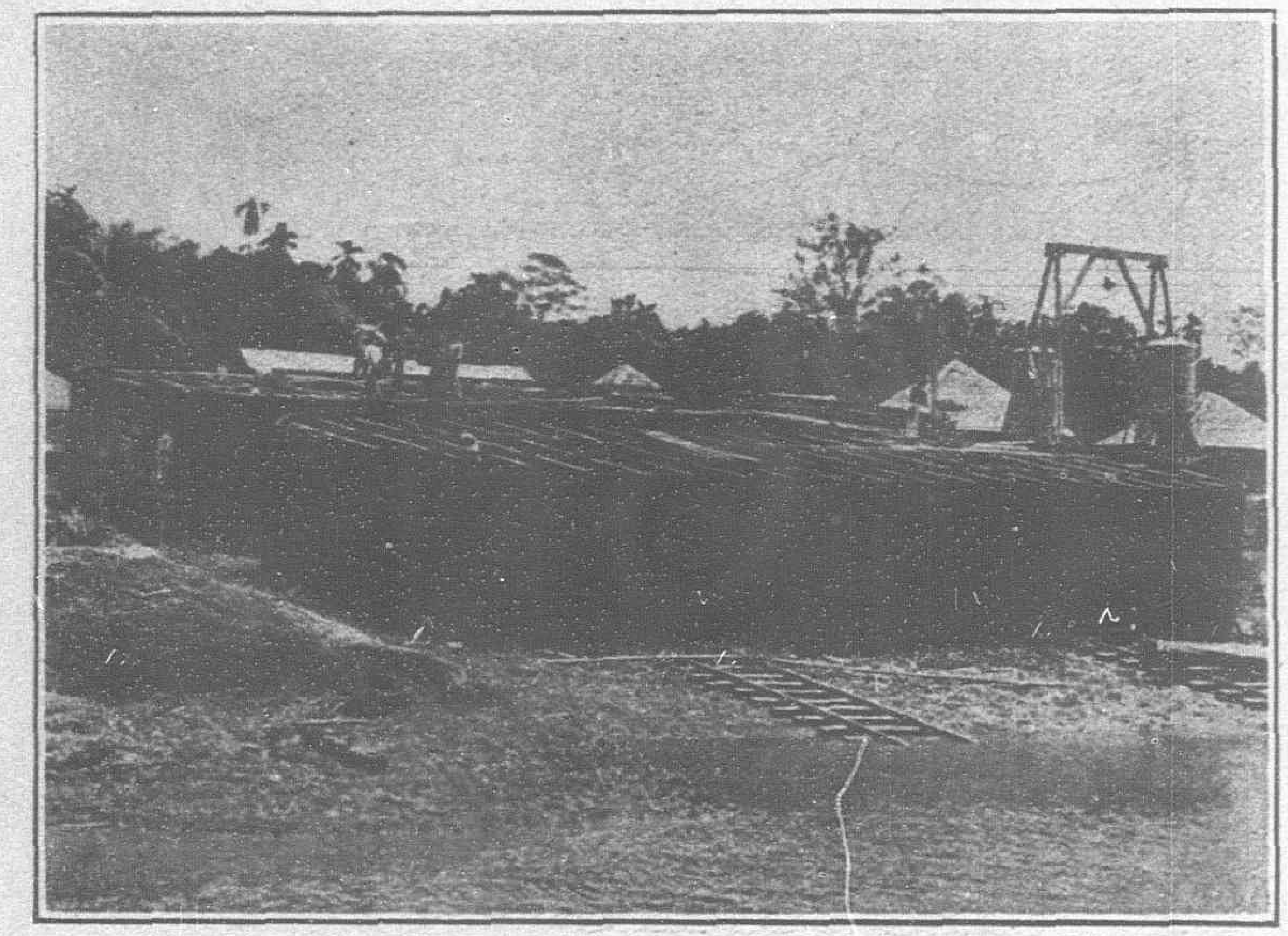
The contract sum for the bridge complete in all particulars is Tcs. 2,784,113. Work was begun in December, 1922, and the substructure was completed in February, 1926.

Detailed Description of the Construction of Abutments and Piers

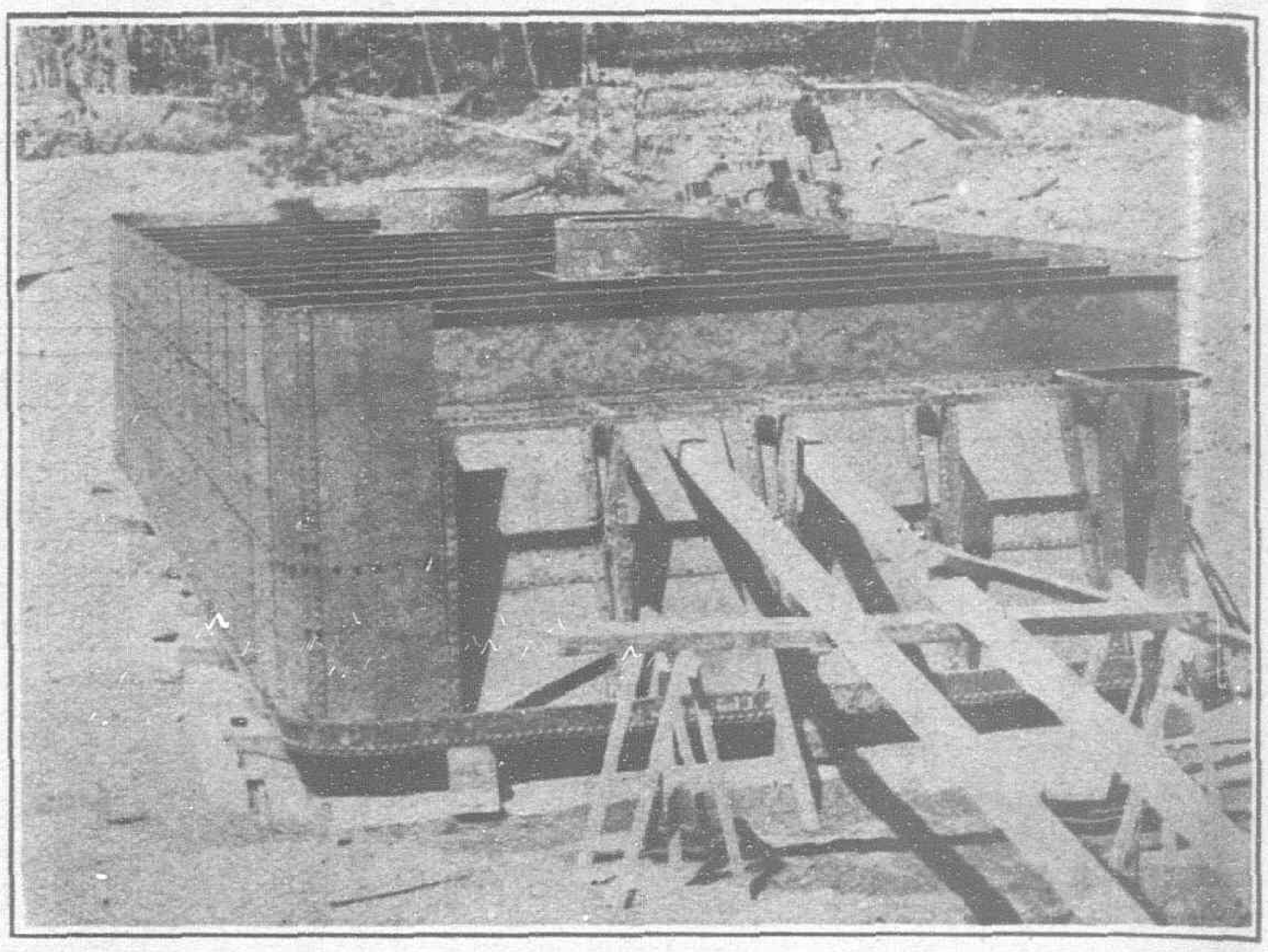
The Caisson.

The caisson consists of a working chamber and rows of steel plates. The working chamber has a vertical wall outside and an inclined one inside with a ceiling covering up the whole of the space inside and the top of the inclined wall. The caisson is 23 m. long and 9.5 m. wide on the outside.

The working chamber is assembled in the following manner:— First the strong cutting edge is laid out over double timber wedges and



Working Chambers of Nos. 2 and 3 Caissons on Slipway



Caisson for West Abutment being Assembled at site. Note Angle Frames which form the Cutting Edge

connected together, thus forming the shape of the chamber. The wedges are used so that the whole of the assembled piece may be adjusted and made level. Frames made of angle pieces are then erected over the cutting edge and to these are rivetted steel sheets 5 m/m thick to form the walls.

On top of the vertical framework are placed lattice girders to the underside of which are rivetted the plates forming the ceiling of the working chamber. These girders are calculated to bear the weight of the concrete and other loads above the chamber during the process of sinking the foundation.

Between each joint is placed specially treated felt and the joint is also caulked with mastic to make the whole work water-tight. Two holes are left in the ceiling where the chimneys are fixed.

The working chamber and side plates together form what is known as the caisson. For each abutment the working chamber itself weighs 22.024 tons. For the East abutment there are 10 rows of fixed plates each 1 m. high and weighing 2.027 tons. For the West abutment there are 11 rows as the foundation is 1 m. deeper.

For each pier the working chamber is 50 tons in weight and there are 11 rows of fixed plates each also 1 m. high and weighing 3.169 tons.

There are also moveable side plates which can be attached at the top when required and which can be removed afterwards. These are made of plates of the same thickness. Each plate is 1 m. by 3.54 m. and has mild steel angles on all 4 sides to strengthen it and also to be used for the purpose of attachment. These will be described later on in more detail.

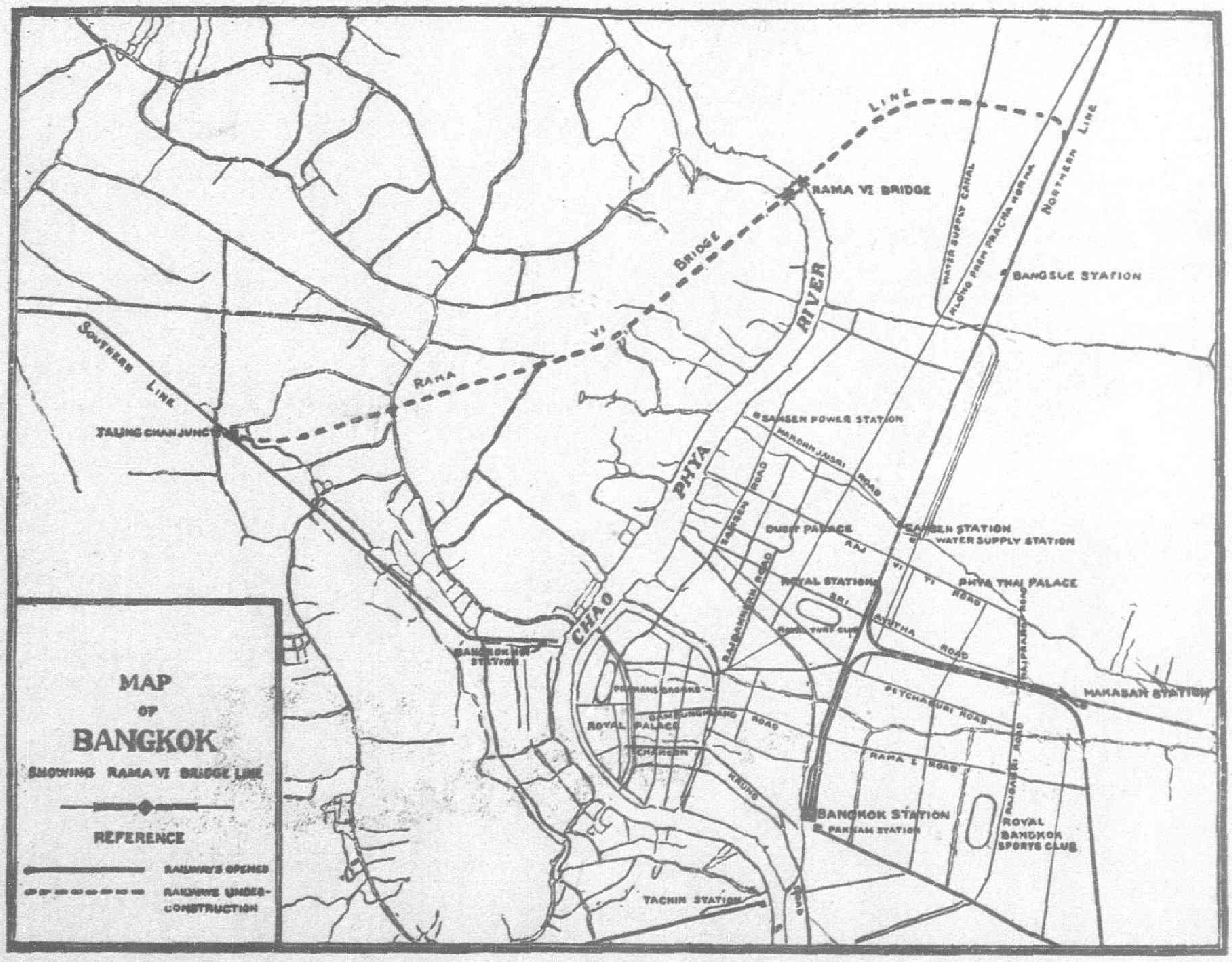
For the two abutments the working chambers were assembled in place, in pits already dug about 2 m. below ground level; but for the piers they were assembled on a specially prepared slipway. The slipway is inclined into a canal wide enough to float the chamber and it has two standard gauge lines laid 11 m. apart on concrete foundations.

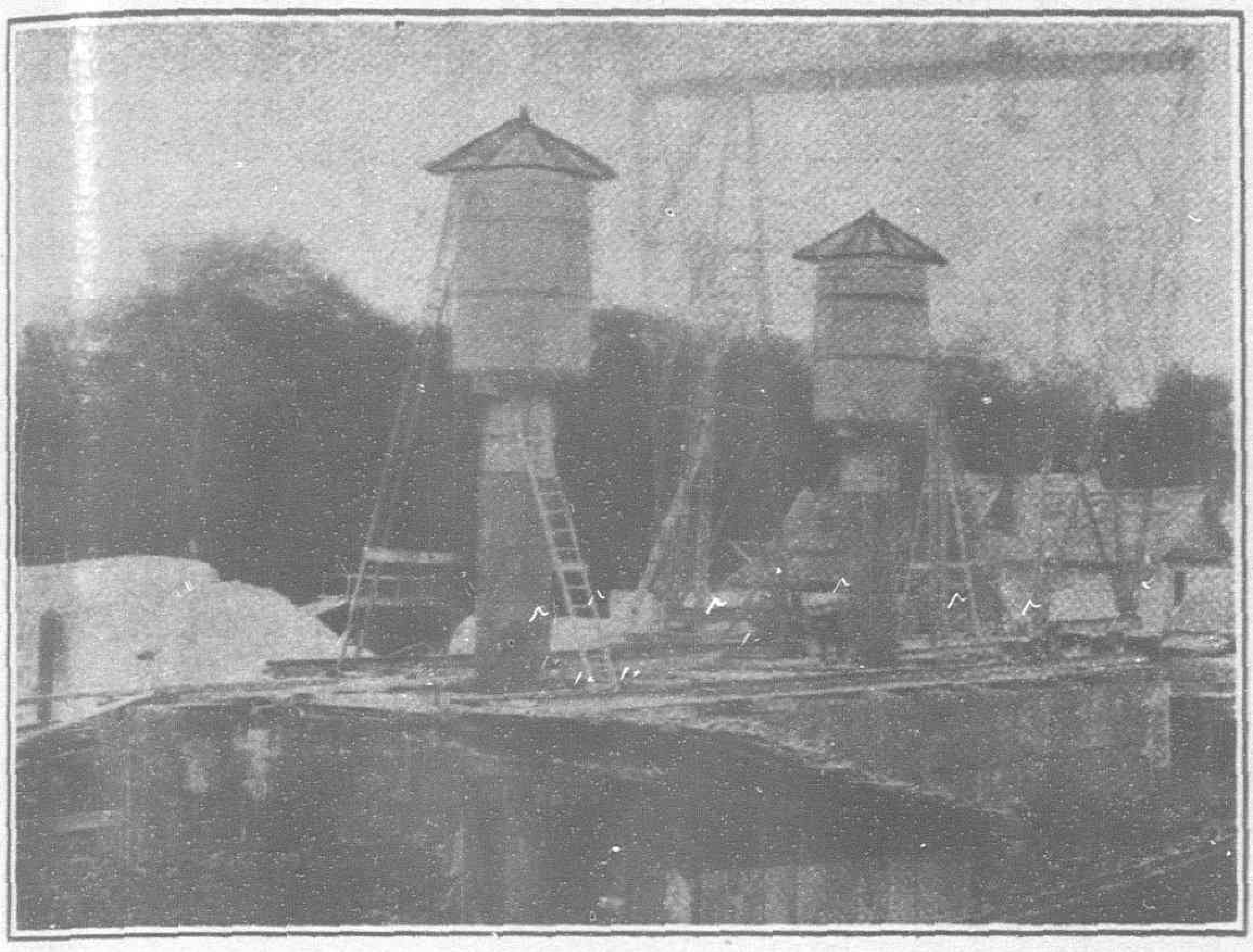
The cutting edge of the chamber rests on 8 specially cast runners which ride over the rails. Screw jacks and winches are employed to launch the chamber when required. When floating the water on the outside is about level with the ceiling.

Placing Working Chamber in position for Land Piers.

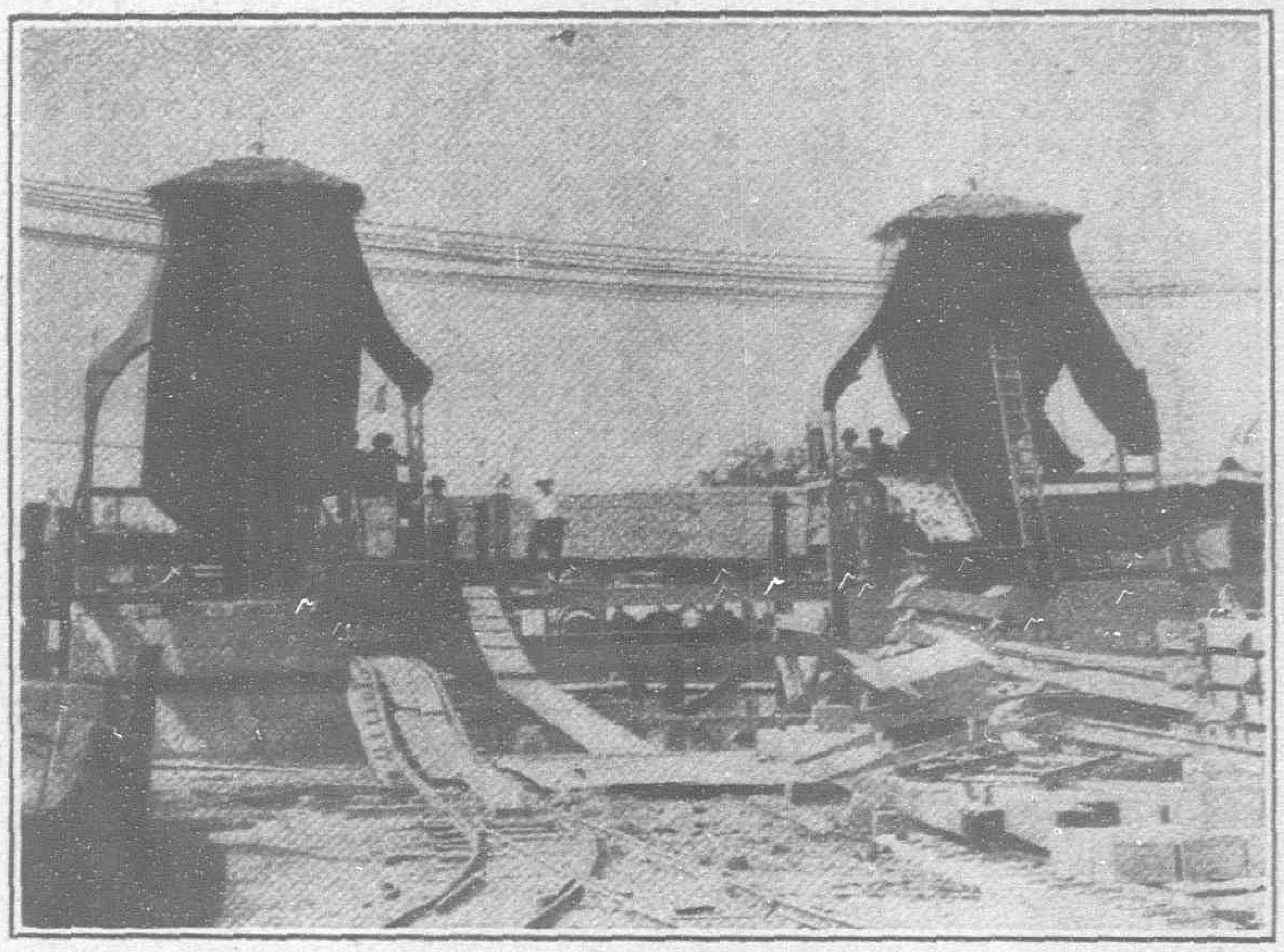
The two land piers are on the banks of the river but are surrounded by water at high tide.

Preparation is first made at the site by digging and levelling the ground so that the depth of water is sufficient to float in the chamber at high tide. About 20 cms. of cutting edge is sealed and streng-thened by cement mortar before launching. The chamber is towed to the site from the Klong, is brought into position by means of guide posts put up for the purpose, and is kept in place by means of wire ropes. When the tide goes down the chamber settles on the ground, and if it has settled in its proper position





Pier 5. Caisson has been Sunk 7m. by Open Air Excavation. Compressed Air Work about to be Started, and Chimneys and Air Locks Already put in



Caisson No. 2 During Sinking Operation. Note Lower Part of Pier Legs which are kept above Water

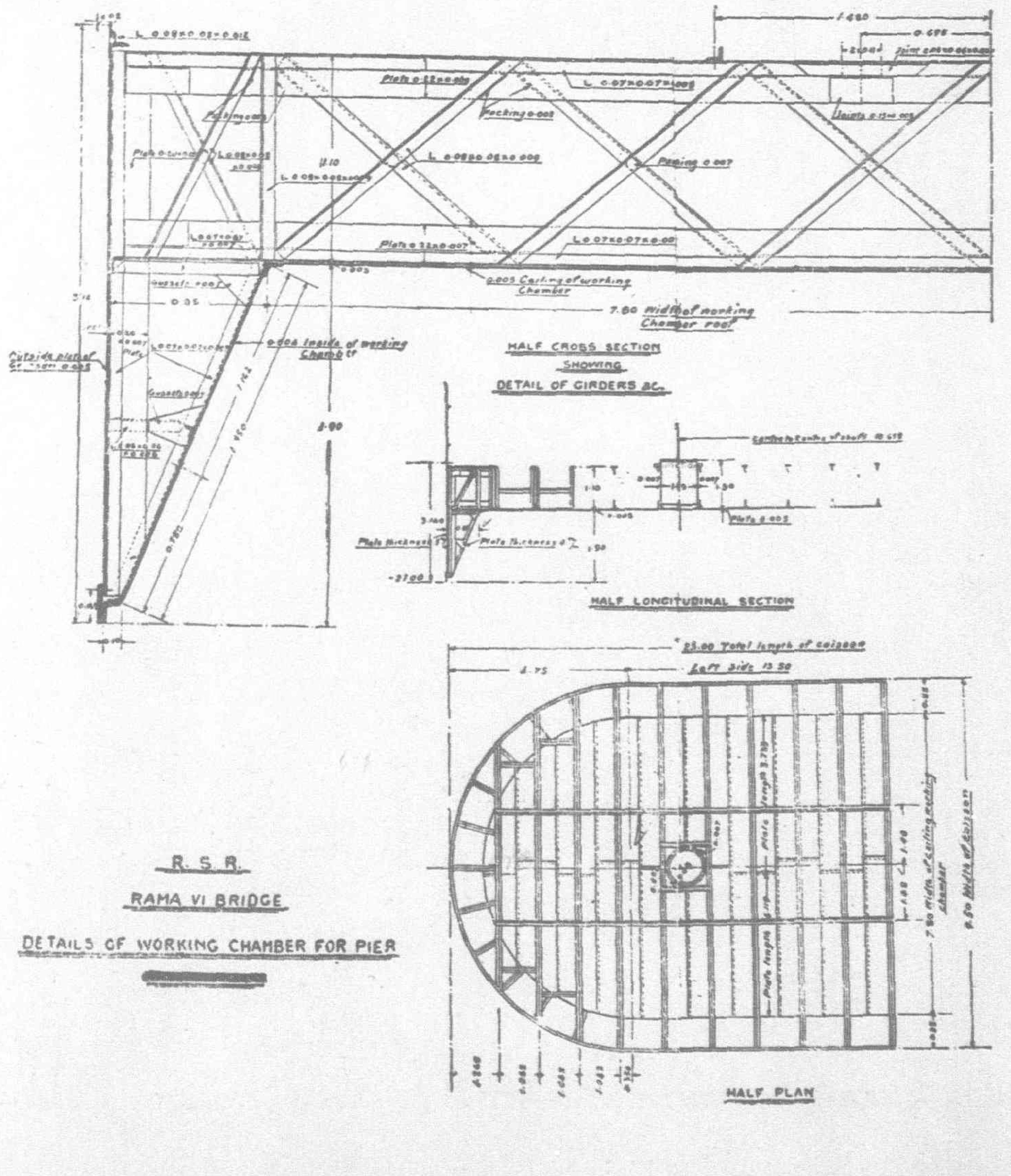
concrete is quickly placed inside the knife-edge in order to prevent the chamber from floating again at the succeeding high tide. If the chamber has not settled correctly, it has to be floated again on the next tide and so on until the correct position is obtained.

It was thought that the caisson for the land pier was sure to move slightly towards the river during the sinking operation and the longitudinal axis of each caisson was therefore displaced 20 cms. towards the land at the beginning. On the East side movement did take place and to such an extent that after 14 m. of the caisson had been sunk the axis was found to be out of its correct position and towards the river by approximately 25 cms. which means that the whole caisson had moved a distance of 45 cms. No displacement took place after this. On the West side however no appreciable displacement was noticed throughout the whole of the sinking operation.

When the working chamber already described has been placed in its correct position and after it has been concreted sufficiently to prevent it from refloating, whatever water there is in the chamber is pumped out. Side plates 5 m/m thick are added to the caisson, 1 m. in hight at a time.

These are rivetted together with specially treated felt between the joints and are caulked with mastic so that the joints are water tight. The plates are strengthened by means of specially shaped angle-pieces running completely round in the middle of each row. The plates act as a wall to exclude water from the pier caissons and earth from the abutment caissons. For this reason they are further reinforced against the outside pressure by means of internal timber struts from wall to wall. Tie pieces made of flat steel plates are also fixed between the walls to prevent them from bulging, but throughout this work they have not been found to be necessary. As the plates are built up the whole floor on top of the chamber is covered with solid concrete 2.1 m. deep. This concrete is cast touching the fixed chimneys, but above it a space is allowed for clearance and a hole 1.20 m. is left for each chimney so that the rest of the chimneys can be taken out afterwards. No formwork is used to cast these holes or for the casting of the large voids left in the piers and abutments, concrete blocks 18 by 18 by 28 cms. being specially made at site of work for the purpose. The mixture used is 1:3:6 with 5 cms. stones. The blocks are cast fairly dry in steel forms, are taken out as soon as they are cast and left to dry on planks in a shed. They are removed and stacked outside after 24 hours and are kept watered for 15 days. For taking the cast blocks out of the form, a piece of wood which just fits inside the form placed on top of the concrete. On top of this is placed another plank so made at the other end to fit a man's chest. The man with his two hands on the handles of the form bends down and presses his chest against the 2nd. piece of timber and gently pulls the form out, leaving the cast block on the plank. The surfaces are dressed afterwards while the concrete is still green by means of trowels.

These blocks are built up with mortar



R. S. R.

RAMA VI BRIDGE

DETAILS OF WORKING CHAMBER FOR PIER

HALF CROSS SECTION SHOWING DETAIL OF GIRDERS &c.
HALF LONGITUDINAL SECTION
HALF PLAN
7.80 Width of working Chamber roof
0.005 Casing of working Chamber
0.006 Inside of working Chamber
Outside plate of
25.00 Total length of caisson
Left side 13.50
4.75
1.420
0.698
1.10
1.50
3.90
-27.00
Plate thickness
Packing 0.008
Packing 0.007
Centre to Centre of shafts 10.619
Plate 0.005

around any holes that are required to be left and take the place of formworks.

When so much of the concrete has been cast on top of the chamber the whole caisson has sunk down by the super-imposed weight so that the earth is now right up to and bearing on the ceiling of the working chamber, the knife-edge having cut right into the soft clay.

SINKING OPERATION.

Many methods of excavating the earth from inside the working chamber were used at this work and they will be described in detail in the order in which they were executed. For the purpose of easy reference the abutments and piers are numbered 1 to 6 from East to West.

When the earth is right up to the ceiling of the working chamber it is necessary to dig it out to make the caisson sink and at the same time to build up on top to keep the work just above ground level and also to add weight to the caisson.

As will be seen from the results of borings made the first layer of clay is soft and also impervious. No water enters the caisson from underneath and it was possible to do open air excavation by hand.

Excavation was possible only at the opening at the bottom of the chimney and not from inside the chamber as there is nothing to hold the caisson up. The earth was thrown up in stages from hand to hand. Owing to the fact that the clay is very soft, the hole where the earth has just been excavated is always filled up by the flow of clay coming to take its place due to the pressure of the caisson on top. In this way the East abutment was sunk until the cutting-edge reached—4.62 m. and Piers No. 2 and No. 5 to—8.80 and—7.06 m. M.S.L. respectively.

The caisson sank very steadily and without much tilt. Whenever a slight tilt occurred it was corrected by adding more concrete on the high side thus weighing it down. This open air excavation from the bottom of the chimney was possible because of the soft nature of the ground enabling it to flow under pressure. As the caisson sinks more side plates are added.

This steel wall is strengthened by means of a wall of concrete blocks built up against it besides being strutted up as well. The concreting of the base also proceeds to keep pace with the sinking, thus the work is built up from the foundation as it sinks down to the required level. However, with the caisson arranged as described open air excavation cannot go on beyond a certain depth and it becomes necessary to put on the compressed air.

The ground becomes stiffer, offers more resistance and does not flow readily as before. Also it becomes unsafe if any tilt should occur. It is necessary now to dig under the ceiling to leave voids in the chamber in order to sink the caisson. To do so in the open air would be dangerous and an impracticable task. Suppose it were possible to dig and enlarge the hole round the chimney into the chamber. The earth may crumble up at any moment underneath the enormous weight above and bury the workmen. It is necessary to prop up the caisson to prevent it from sinking except at will. To do this compressed air work is resorted to.

A strong platform is built just outside and at one end of the caisson. On it, is erected a steel travelling crane with its wheels on a pair of rails.

A temporary staging is erected on top of the concrete work on the caisson so that the rails on the platform may be extended along the length of the caisson. When this is done the travelling crane is moved over the hole left for the chimney and by means of a set of differential pulleys a length of chimney 1.05 m. diam. is dropped in and bolted on to the chimney already fixed to the working chamber.

An india rubber washer is used at each joint to make it air tight. Length after length is added to chimney until it is well up above the concrete work and the ground level. There are 3 lengths of chimney in use—1 m., 2 m. and 4 m. so that the required height may be adjusted. To steady it, wooden wedges are placed between the outside of the chimney and the concrete built round it.

When this is done an air lock is placed on top of each chimney by means of the travelling crane. The lock serves as entrance and exit for the workmen, materials &c.

A pipe 10 cm. diam. is also placed alongside the chimney and this pipe serves several purposes, viz :—

(1) For the outlet of stale air from the working chamber.

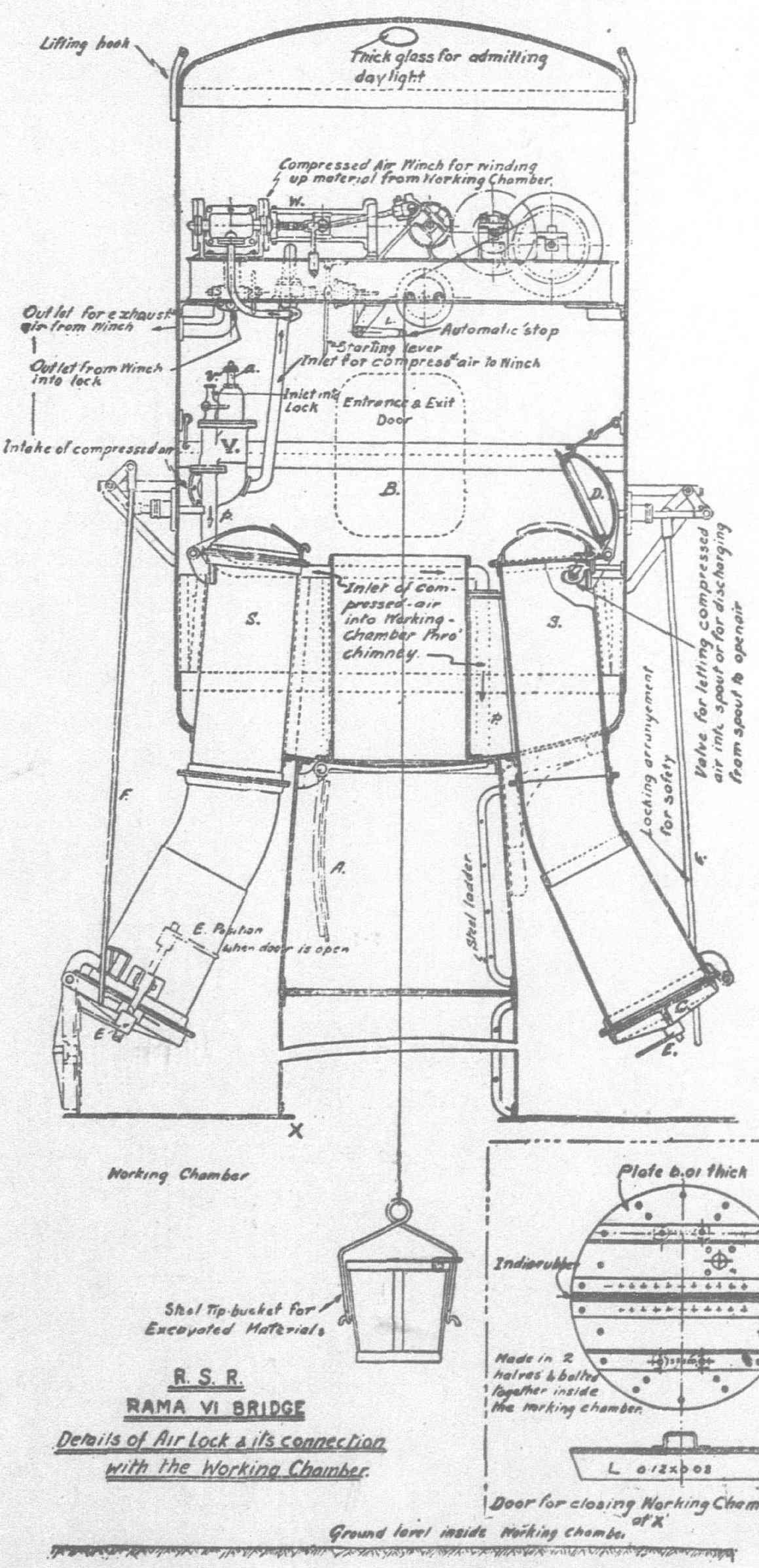
(2) For siphoning purposes.

or (3) For taking down electric wires for lighting inside the chamber.

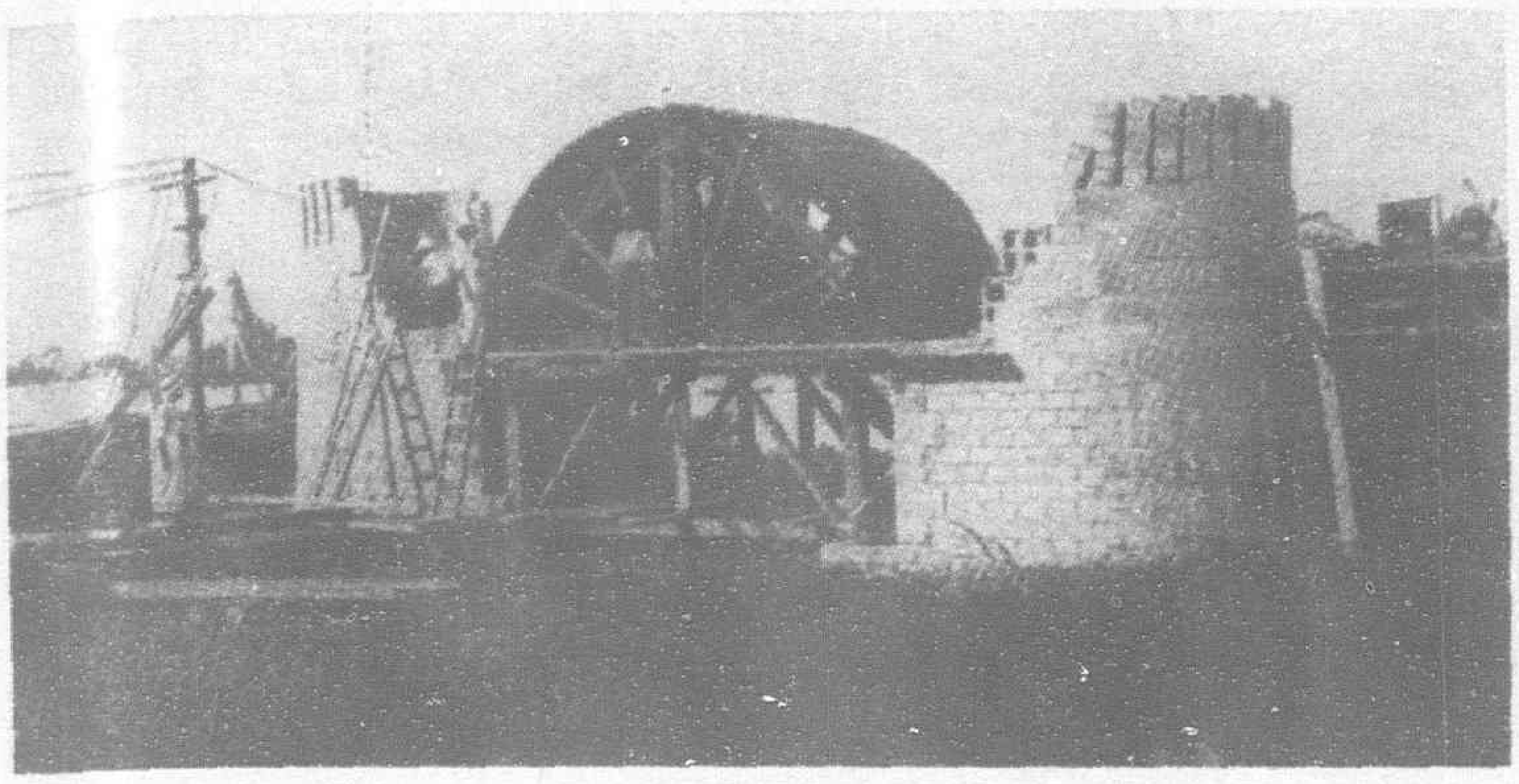
There is a valve at the lower end of the pipe inside the working chamber and thus it can be opened and closed at will from inside.

The valve or door "A" at the neck of the air lock serves to make or cut off connection between the working chamber and the air lock. A flexible pipe connects up the supply pipe from the compressor to the lock. Compressed air is pumped into the chamber through pipe "p" and regulating valve "v." This valve "v" opens inward and can be regulated by means of an adjustable screw "a" on top to work at any desired pressure. Thus if the pressure from outside drops through any cause the valve closes automatically by the pressure from inside the chamber and prevents any escape of air.

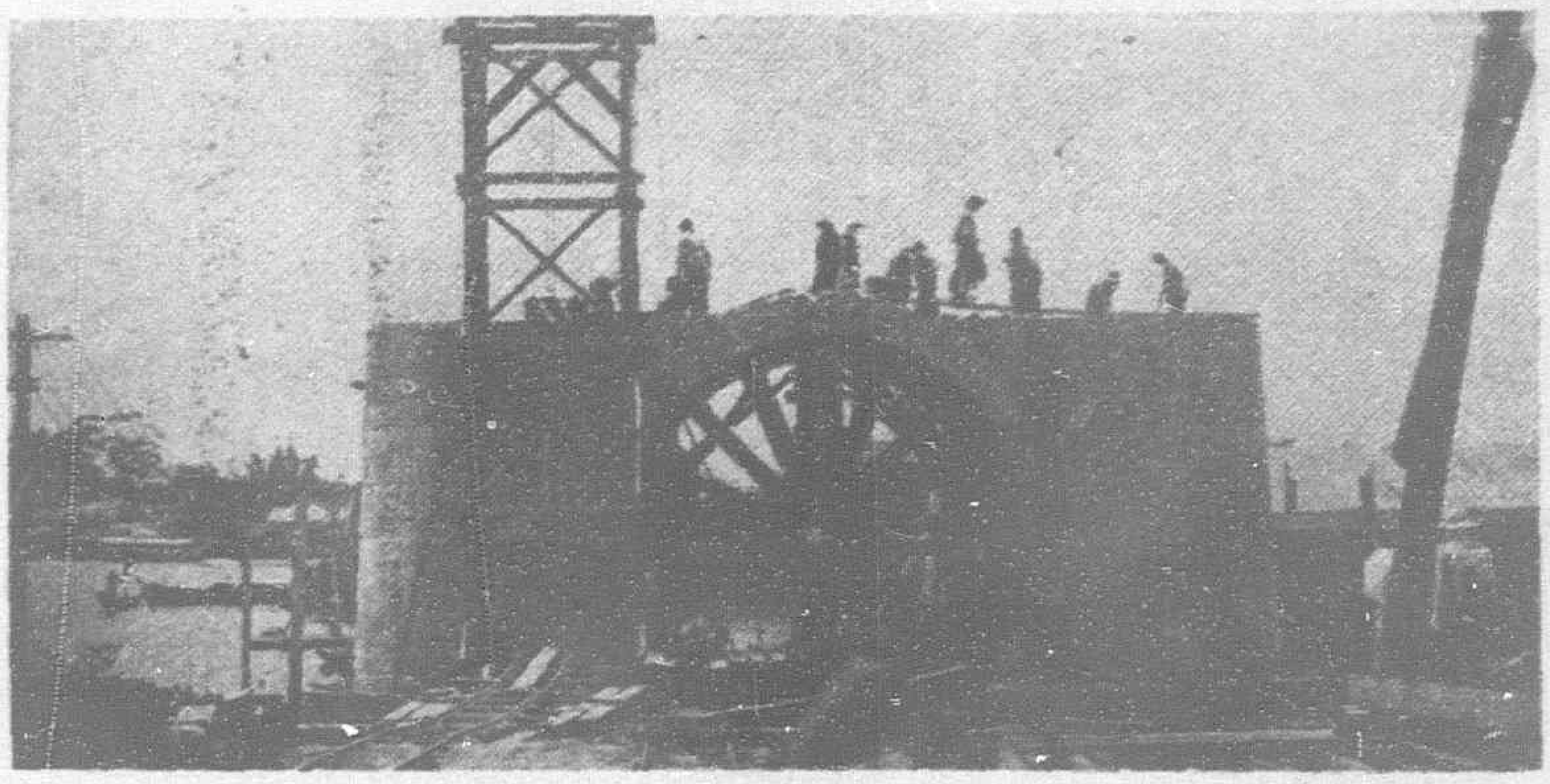
The entrance of men or materials into the working chamber is done as follows :—


Lifting hook
Thick glass for admitting day light
Compressed Air Winch for winding up material from Working Chamber.
W.
Outlet for exhaust air from Winch
Outlet from Winch into lock
Automatic stop
Starting lever
Inlet for compressd air to Winch
v.
a.
Inlet into Lock
Entrance & Exit Door
Intake of compressed air
V.
B.
D.
p.
Inlet of compressed-air into Working-Chamber thro' chimney.
S.
S.
P.
Valve for letting compressed air into spout or for discharging from spout to open air
Locking arrangement for safety
F.
F.
A.
Steel ladder
E. Position when door is open
E
C.
E.
X
Working Chamber
Steel Tip-bucket for Excavated Materials
Plate 0.01 thick
Indiarubber
Made in 2 halves & bolted together inside the working chamber.
L 0.12x0.08
Door for closing Working Chamber at 'X'
Ground level inside Working Chamber

R. S. R.
RAMA VI BRIDGE
Details of Air Lock & its connection with the Working Chamber.



Arch Centring in Position



Pier No. 2 Being Built Up

Assuming that door " A " is closed and that the chamber is under compressed air but that the lock is not. Door " B " to air lock is open and the pressure in the lock is the same as outside.

After the men or materials have entered the air lock, door " B " is closed from the inside and tightened with bolts and nuts, valve ' v " is then opened allowing compressed air to enter the lock.

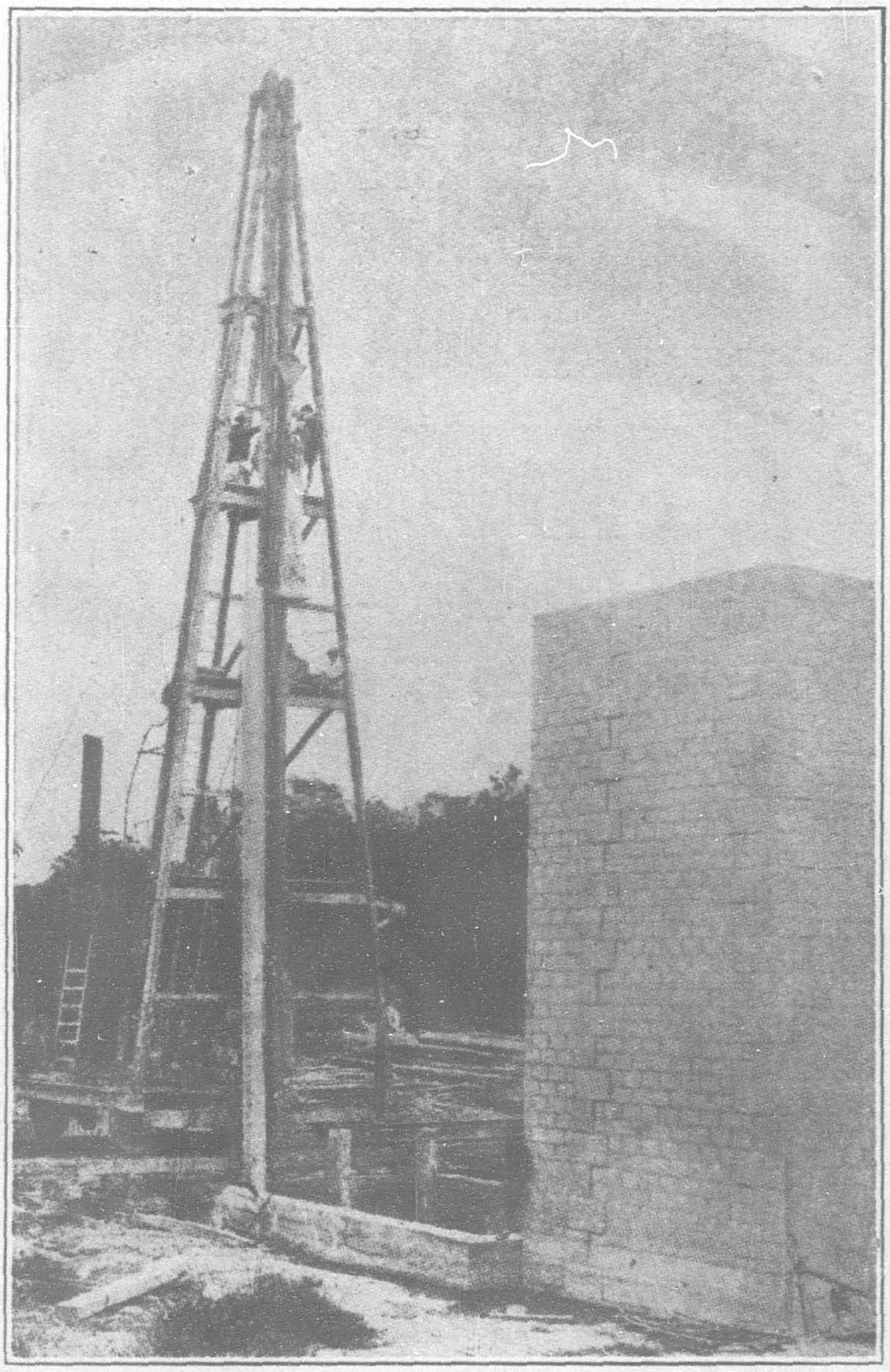
When the pressure inside the lock is the same as that inside the working chamber and the communicating chimney, door " A " can be opened and the men can climb down by means of an iron ladder fixed inside the chimney. For coming out the process is reversed. When the men have all entered the lock, door " A " is closed and the pressure is gradually let out to the outside air by a valve attached to the side of the chimney. When it is the same as that of the atmosphere, door " B " is opened and communication is thus made with the outside.

Care must be taken that the pressure is increased or reduced slowly, especially the latter, and this can be seen by means of the pressure gauge. If the pressure is released too quickly the men are liable to have pains in their joints afterwards or to bleed at the nose as they come out, due to the too sudden change of the pressure.

The safe rate is 0.1 kg. per square centimetre to the minute, i.e. 20 minutes to change the air from 2 kgs. per square centimetre above atmosphere to that of the atmosphere. Generally, however, the men, wishing to come out quickly, exceed this by a great deal.

The first sensation when the pressure is put on is an ache caused by the pressures on the outside and inside of the ear drums being different. To get rid of this one must close the mouth and nose and blow hard at intervals to equalise the pressure on the ear drums. Afterwards the feeling is quite ordinary excepting that the atmosphere appears thick and heavy. The whole atmosphere under pressure is foggy and very damp, every thing being wet all round, and hotter than outside. At a pressure of 2 kgs. per sq. cm. it is from 3 to 4 degrees Centigrade hotter.

When both air locks are erected, the travelling crane is moved back to its platform and the rails and temporary staging removed from the caisson.



Driving the Last Pile for Wing Wall of W. Abutment

The earth from inside the working chamber can now be excavated without fear of the caisson going down.

The air pumped in under pressure fills up the void formed by excavating, and bearing on the ceiling with a pressure of so much per sq. cm. keeps the caisson up and at the same time pushes out any water that has a tendency to come inside the chamber.

It is desirable to keep the pressure low as it is easier for the workmen and they can endure it longer. The ideal point to aim at in such a case, where there is water to keep out, is to have a pressure which is just sufficient to counter-balance the hydrostatic head of water at the cutting edge. This will keep the water out of the working chamber.

At the same time care must be taken that the load on top does not exceed that which the air pressure can keep up. In cases like this side friction should not be considered as giving any help at all. The following example will make the above clear.

Suppose the cutting edge is 20 m. below water level, then the pressure necessary to keep the water out is 2 kgs. per sq. cm. Now the area of the base of the caisson is 199 sq. m. With a pressure of 2 kgs per sq. cm. which is the same as 20 tons per sq. m. the upwards thrust of the compressed air is 199 by 20=3,980 tons.

The weight of the caisson and the concrete on top of the working chamber should be about the same as this. If it is too light the whole caisson will be pushed upwards as happened once at No. 2 when the pressure became too much and the pier was lifted some 20 cms. If the weight is more, then the pressure has to be increased or else the caisson will sink. At this work there was not much trouble with water, until towards the end, as the clay is impervious.

A certain amount of leakage occurs all the time through little fissures in the ground and at the cutting edge, the escaped air can be seen bubbling up at the sides or away in the river or on land close by. When the depth becomes greater the leakage at the side is very much reduced but air escapes elsewhere, sometimes over 100 m. away.

When the pressure becomes large there is a danger of the ground giving way to it, thus causing a large escape of air, technically known as " Blowing."

If the blowing becomes serious the air pressure in the caisson cannot be kept up and it becomes necessary to seal up the ground all round for a certain radius. This is very expensive but it has been carried out at other works. A thick blanket of clay has to be placed over the ground all round the site of the caisson to seal up the blows.

Fortunately nothing of this kind happened here, which shows that the ground is good and that it can stand the pressure.

It is obvious from what has been said above that the pressure must be kept up inside the work chamber and that the compressor must always be kept working. Dangerous accidents to the works may occur if the pressure fails.

There is however not so much danger from this cause to the men working below as is generally believed because if the machine stops the leakage is slow and they have plenty of time to come out before the caisson settles sufficiently to endanger their lives. But if the machine fails for a long time the caisson will sink and may tilt in sinking or disappear below water level &c.

For each caisson there are two compressors working in turn day and night, each driven by an electric motor. The current comes from the Samsen Power Station and to prevent possibility of failure two sets of mains are laid. If the fuse of one set blows or if the wire breaks the current from the other can be switched on at once. This fairly well covers occurrences due to line or fuse being damaged, but it does not safeguard against accidents to machinery &c. at the source of supply. If this happens the power at the compressor is cut off definitely and without notice. (This occurred once but fortunately it lasted only about half an hour and no damage was caused).

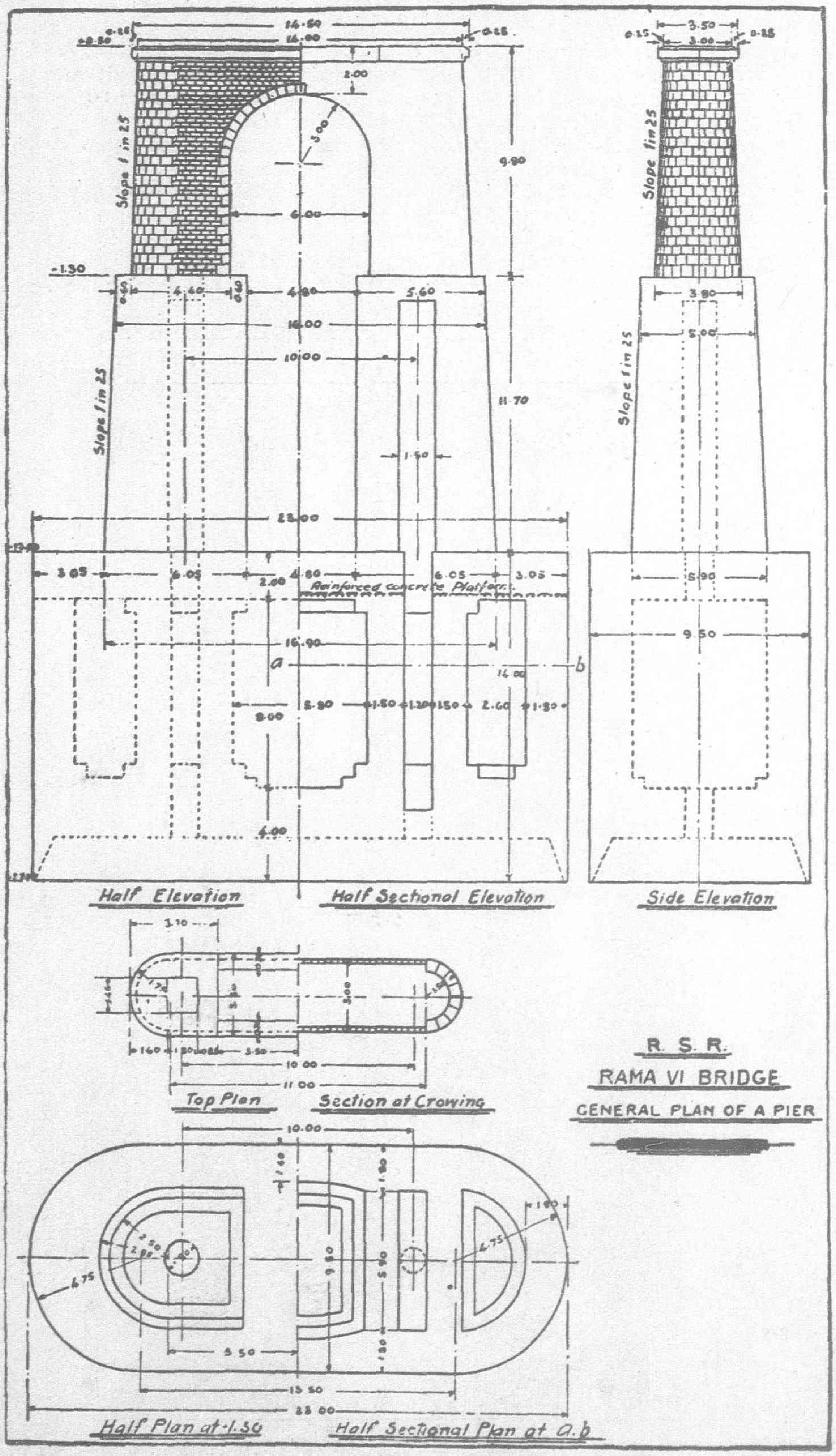
The Samsen Power Station however stops its supply at intervals of from 3 to 4 weeks for about 3 hours. This happens on Sundays at 6 o'clock. The stop is for inspection of the main lines and overhaul of engine &c. Information as regards the stoppage is however received well in advance and preparation is made to prevent the caisson from sinking. The leakage of air is fairly slow and the drop of pressure during the 3 hours is generally about 1 kg. per sq. cm.

Sleepers are sent down into the working chamber to be made into sleeper stacks to give additional support, and sleepers or wedges are also put under the cutting edge to give further bearing power.

The stoppage is an inconvenience to the work, especially during the concreting of the working chamber.

To overcome this inconvenience and also to safeguard against any failure of the power at the source the contractor provided a small compressor worked by petrol motor towards the end of work at Pier No. 2.

This compressor is coupled up to the delivery pipe and is capable of keeping the pressure up to about 2.9 kgs. per sq. cm. when the main machines are shut down.



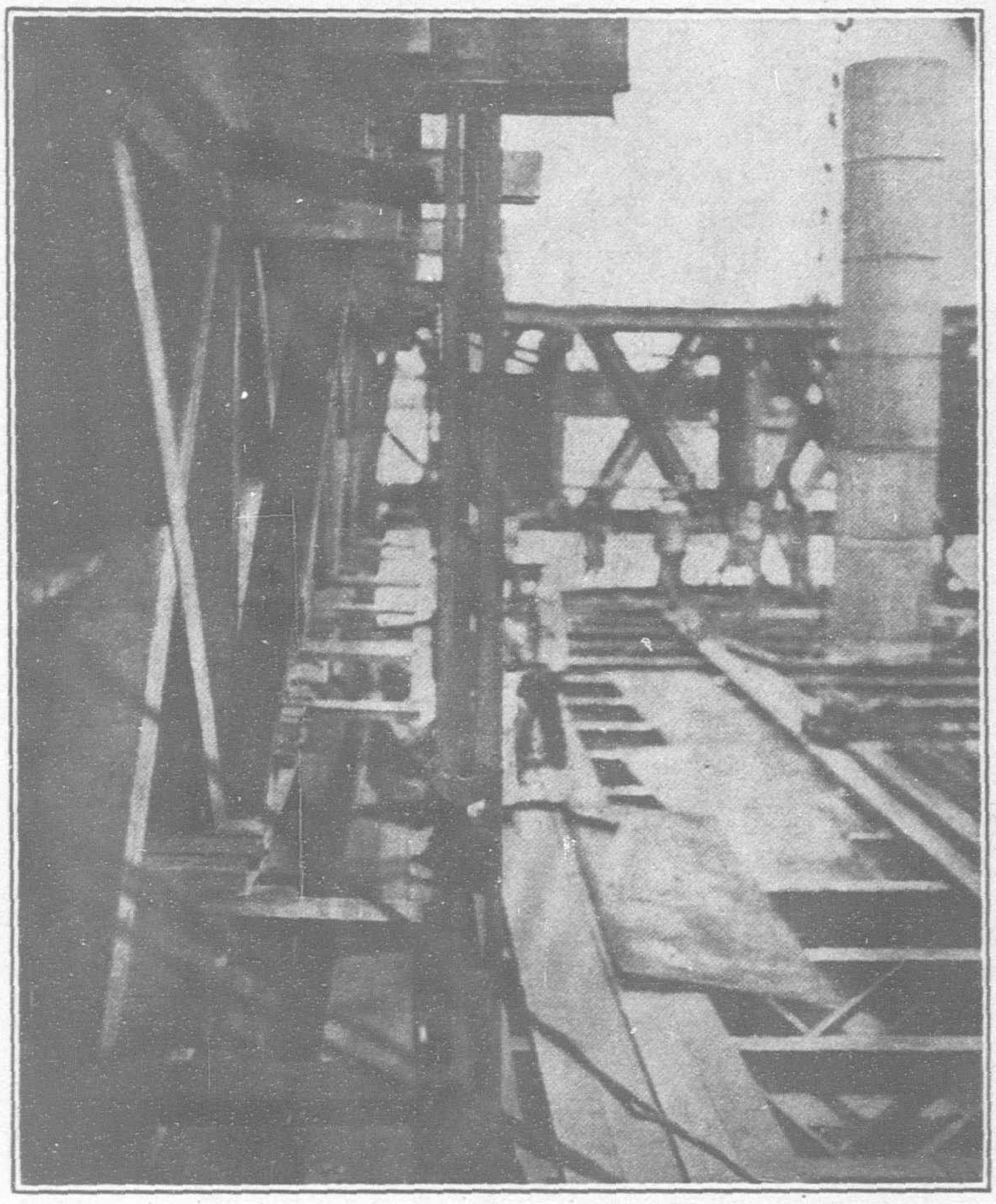
As the caission sinks the air locks go down with it. The concrete work is carried up until the air locks interfere with further progress. Then the travelling crane is again used to lift up the air locks and to add another length to each chimney.

Before lifting up the air lock the working chamber is closed from inside, at the bottom of the chimney by an iron door. This door is detachable and is made in two halves, which can be connected up by bolting the angles together as shown. By this means the lock and chimney can be lifted up without interfering with the work inside the chamber. One lock is lifted up, an extra length of chimney is added on, and the lock replaced. During this time the other lock is in service. Then the first lock is put in use and work is carried out at the 2nd. lock in a similar manner.

SEALING UP THE CAISSON.

When the caisson has been sunk to the required depth experiment is made to see what pressure the ground will bear. It is impracticable to use a direct method of loading i.e. by placing actual weights on a definite area because of the difficulty of getting a large quantity of weight in and out of the caisson. The screw jack is therefore employed instead and the experiment is carried out in the following manner :—

The ground to be tested is first made flat and even. Then a timber block "A" is placed on the ground the lower face being 30 by 30 cms. On top of this is placed another block " B " with a pair of wedges in between for adjusting the height. A screw jack having a pitch of 12 m/m is placed on " B " and again on top of this another wooden block " C " reaching to the ceiling. The wedges are then slightly tightened up so that the whole apparatus is firmly set between ceiling and ground. To prevent the jack from rotating an iron clamp is placed round its lower end and two spikes driven against this clamp into the block on which the jack rests. Also the jack is let into the block " B." A square cap with a plug is placed on top of the jack, the cap being let into the block " C." This is to steady the jack and prevent it from slipping between the blocks.



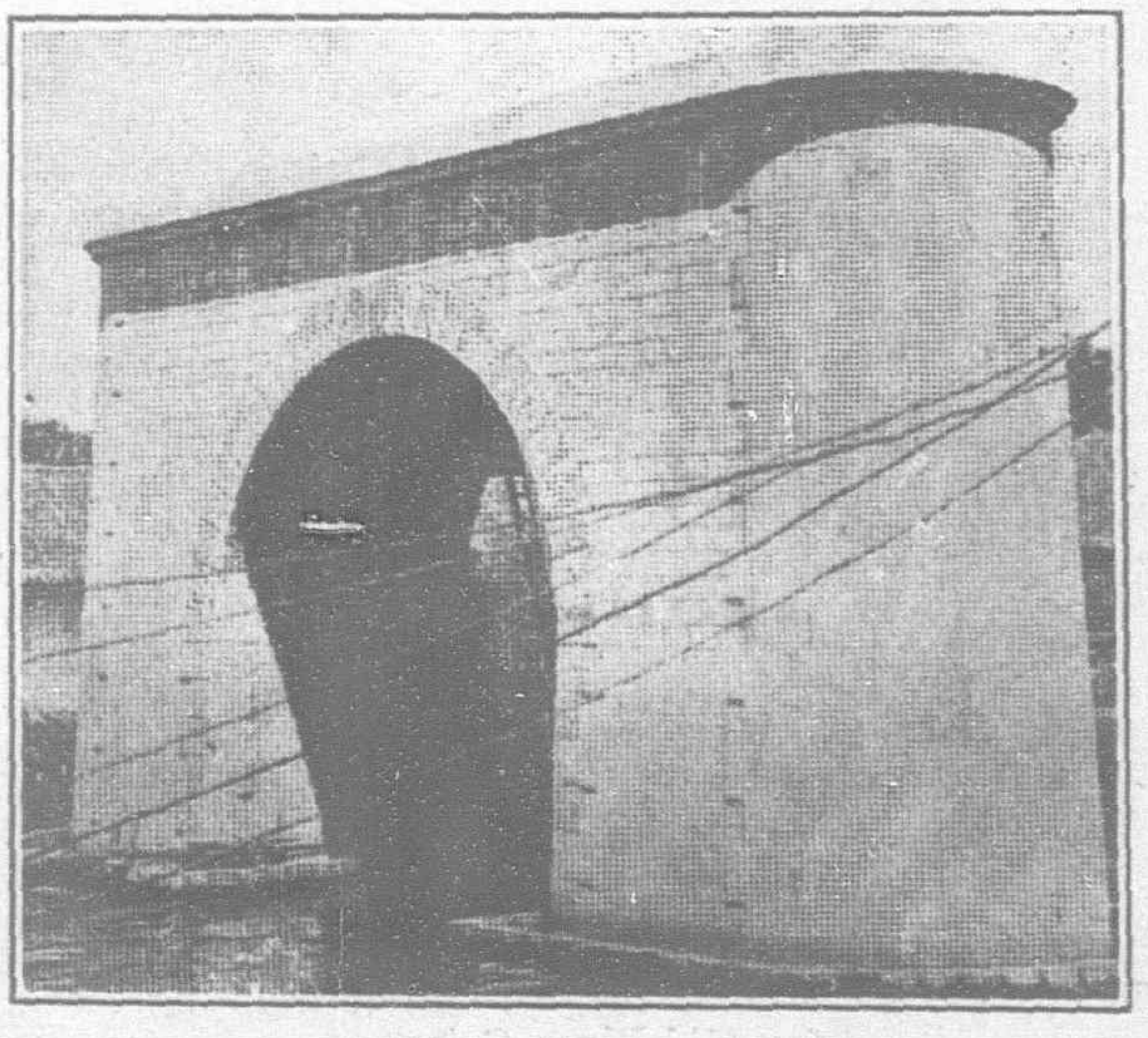
Caisson No. 3 in position. Showing Suspension Link and Jack

On top of the jack is placed a steel bar for turning it. At a known distnace X cms. from the centre of the jack on this bar is attached a strong spring balance. To this is attached a rope and then a cross bar. The jack is then slowly turned by men pulling on this cross bar. Care is taken that the line of pull of the spring balance is always approximately at right angles to the bar and that the pull is steady.

If the results of the test be satisfactory then the sinking can be stopped and the ground made flat and even.

The inside of the chamber is then scraped and well cleaned of all earth and loose rust.

A layer of 30 cms. of dry stone is well rammed into the ground. After this concrete is sent in and the whole chamber gradually concreted up. For sending down stone and concrete a special chimney is attached to the bottom of the lock. This is a chamber attached to the usual round chimney for the purpose of putting in the materials. Door " A " is first closed, compressed air in the little chamber is released into the open air by a valve and door " B " opened. Concrete already mixed is then dumped into the chamber and door " B " closed. Compressed air is then let into the chamber through pipe " P." When the pressure is the same as that inside the chimney door, " A " is opened and the concrete drops right down into the working chamber below on to a wooden platform placed underneath the chimney. The men then carry it to where it is required. The concreting begins first from the two ends of the caisson and approaches the chimneys, then again from the sides towards the centre. During this time there is communication between the two chimneys. After this communication is cut off by concreting up the middle of the chamber and then two parties work each towards its own chimney in narrowing circles until there is no room for the men to keep clear when concrete is being dropped down. Then they have all to come up into the air lock while the concrete is being dropped down and go down after each lot to ram it.



Pier No. 2 Completed

The concrete is not filled flush with the ceiling under the chimney but a cup-shaped hollow is left. Into this is poured liquid grout right up to the level of the fixed chimney. The grout is driven into right up to the level of the fixed chimney. The grout is driven into the crevices in the concrete and in between the ceiling and the concrete by air pressure. The pressure is kept on for 24 hours after this. It is then released and the foundation is completed.

It was found, even a fortnight after the compressors had been stopped that air was still bubbling through the old places where it had been escaping. This is all the remaining air which has been forced into the ground.

When the working chamber is sealed up, the chimneys and air locks are removed and the work of building up the piers is continued.

Detail of Construction of Abutment and Pier

East Abutment.

Counting from the knife-edge, the foundation is solid for a height of 4 m. (1.90 m. for the working chamber and 2.10 m. above the ceiling.). From here two elliptical holes are left in order to lighten the dead weight, but the voids thus formed are calculated as full of water in case leakage may occur. The circumferences of these holes as well as that of the foundation (i.e. next to the steel side of the caisson) are built up of special concrete blocks as mentioned before, thus doing away with timber formworks. These voids are continued for a height of 7 m.

On top of these is cast a reinforced platform 2 m. thick thus finishing up the actual block which forms the base of the abutment. Holes are, however, left round the chimneys in order to allow for the removal of same after the compressed air work is completed. Up to this level the base is of the same shape, the sides being vertical all round. For casting the reinforced concrete platform timber floorings of 2.5 cms. plank with stout cross beams underneath are placed over the voids. The details of steel bars are shown and the mixture used is 1:2:4 for a height of 30 cms.—using stones having a maximum size of 2.5 cms. The platform is cast continuously without stoppage until the whole 30 cms. thickness is completed. After this ordinary mixture of 1:3:6 with 5 cms. stone is used to complete it.

From this level, (13 m. from the base), the abutment actual is built. This work is carried cut after the sinking operation is finished and the workiug chamber concreted up. The rest of the abutment is solid.

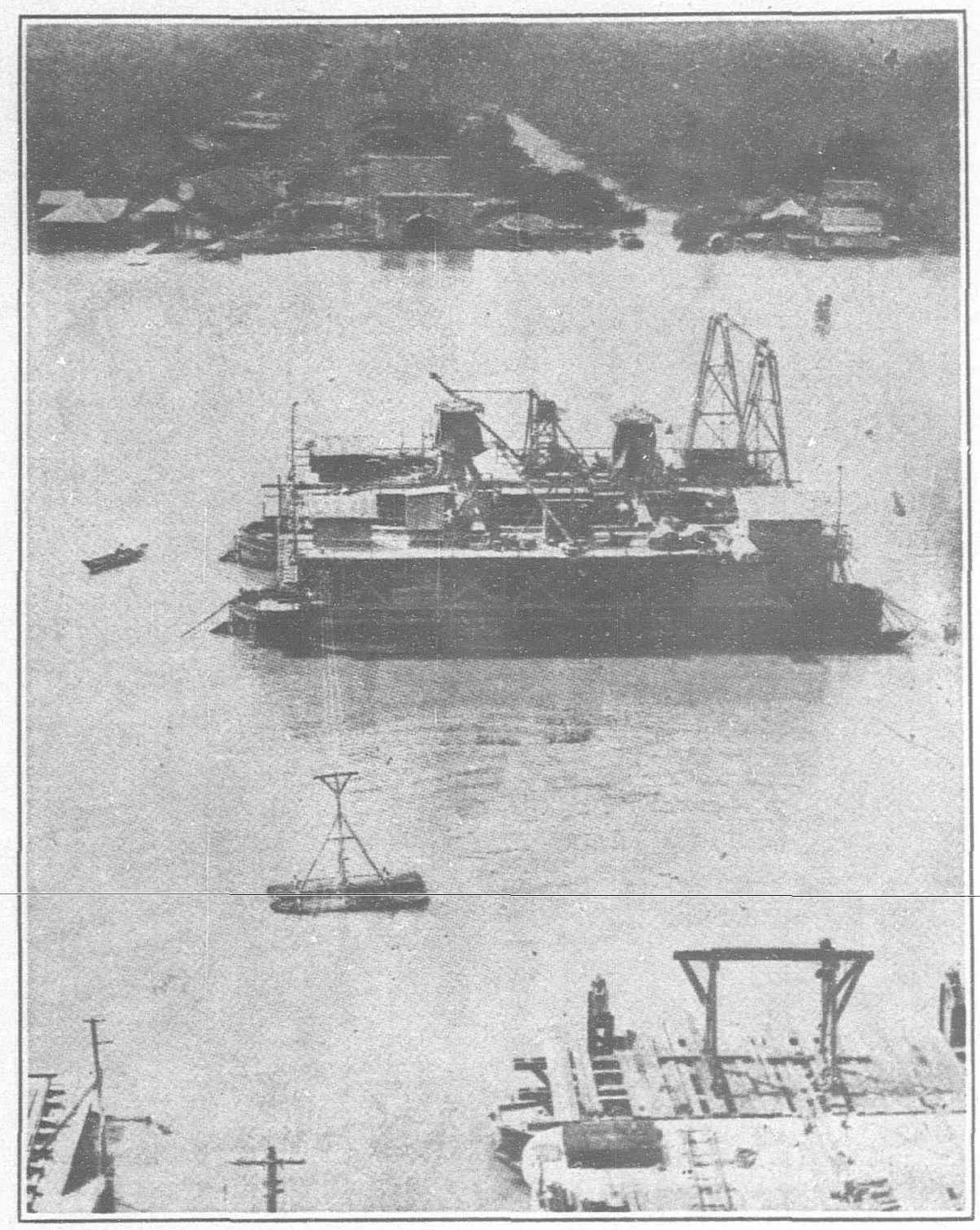
For æsthetic reasons and because real masonry work is too expensive imitation stone blocks are cast for the purpose of building up the piers and abutments.

For the abutments these are of two kinds, viz., the corner blocks and the ordinary surface blocks. The corner blocks are 40 by 60 cms. and 39 cms. high with the proper slopes (4 per cent.) on both front and side faces. They are cast hollow for ease of transport, the voids being afterwards filled up with concrete. The outside faces are made rough to imitate chipped masonry work. The surface blocks are of two sizes 34 by 25 cms. and 34 by 32 cms. by 19 cms. high and are cast solid with indentations on the top to distinguish between the top and bottom (as they are also on a slope) as well as to give better bonding. The outside face is made specially smooth. These two sizes are laid alternately in order to give a good bond between them and the concrete inside.

All these blocks are made of 1:2:4 concrete with 2.5 cms. stones and are cast very dry and well hammered down. They are taken out of the mould directly after casting and kept well watered.

All the mortar joints are repointed and sunk below the surface evel of the blocks. These blocks are built up to a height of about 1 m. at a time. Then the inside is concrete up with 1:3:6 concrete and the process repeated until the correct level is reached. The crowning work on the top is in reinforced concrete, and the concrete underneath the bearingplates is also reinforced.

The West abutment is constructed on exactly similar lines, only the actual base is 14 m. high instead of 13 m. as this abutment is founded about 1 m. lower.

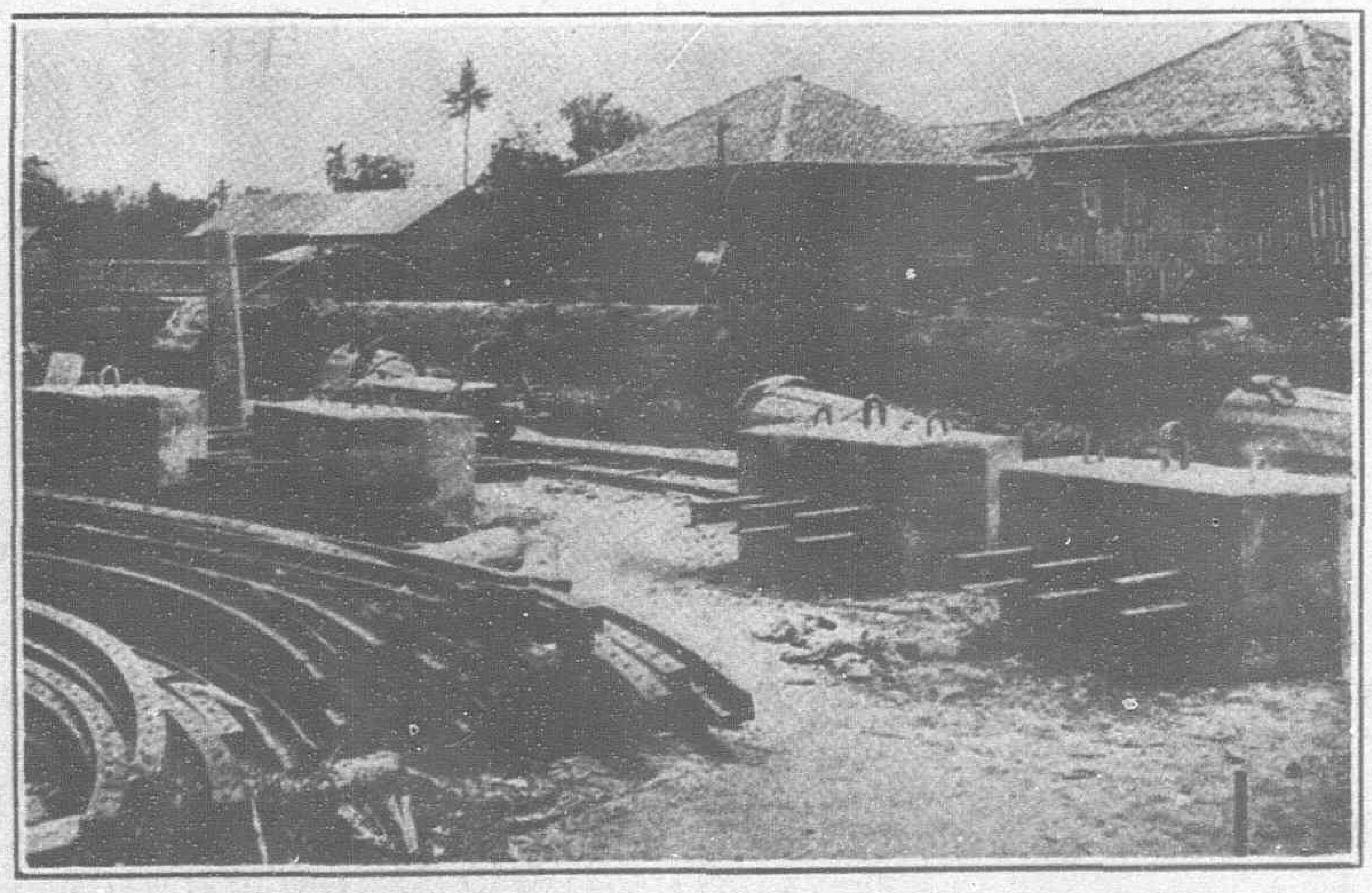


Birds-eye-view Looking Towards West Bank. Taken from Top of Erecting Crane on East Bank

WING WALLS.

In order to reduce the weight of the abutment and thus keep the bearing pressure down to the limit allowed it was designed purely for bearing the superstructure and not as a retaining wall for the approach embankment as well. The bank ends at a distance of approximately 8 m. from the back of the abutment and is supported by a dry stone wall sloping down 1½ to 1 to the ground level at the back of the abutment. This does away with the back pressure on the abutment due to the earth which tends to overturn it. Two separate wing walls on pile foundations are placed one on each side, as shown on fig. 10. These walls are quite apart from the abutment proper, there being a space of 4 cms. between them and the foundations are also separate. If the wing walls of an abutment are built as a unit with the abutments, the foundation should be one unit to ensure that one part does not move relatively to the other. If movement takes place ugly cracks develope and spoil the appearance of the bridge. It is, however, generally not economical to build the wing walls and the abutment on the same solid foundation as they are called upon to bear different pressures. The method adopted here is, therefore, a very sound one, and even if each wing wall should settle a little there will be no cracks.

To bridge the gap between the end of the embankment and the abutment, 2 steel cross-girders are thrown across from wing wall to wing wall. They are connected up with stringers running parallel to the axis of the bridge, and the railway track and the road are placed on these stringers.



Concrete Dead Weight for Anchoring Floating-Plant for Mid-River Caisson

Each wall was originally designed solid with the base at —3.50 m. M.S.L. resting on 15 Ferro-concrete piles 30 by 30 cms. in section and 10 m. long. The Railways Department ruled, however, that the load on each pile must not exceed 25 tons, and consequently the number of piles was increased to 21.

When the first few piles were driven it was found that they did not give the required bearing at the designed level. The contractor then resolved to drive them 2.50 m. lower without lengthening same and the first two piles gave the required bearing of 25 tons each. It was then decided to carry the foundation down to—6.00 instead of—3.50 m. and thus do away with having to lengthen the piles. This increase in depth however involved an increase in dead load, and the base was, therefore, slightly enlarged and the number of piles increased to 28 to take care of the extra weight.

As the piles were being driven it was found that the first two atissfactory results were misleading. These newly driven piles did not give anything like 25 tons bearing.

24 piles (6 rows of 4) were driven for each wall and the average bearing capacity of each pile was only 14 tons.

It was then decided to lighten the walls by making them hollow as finally accepted and shown on fig. 10.

THE PIER.

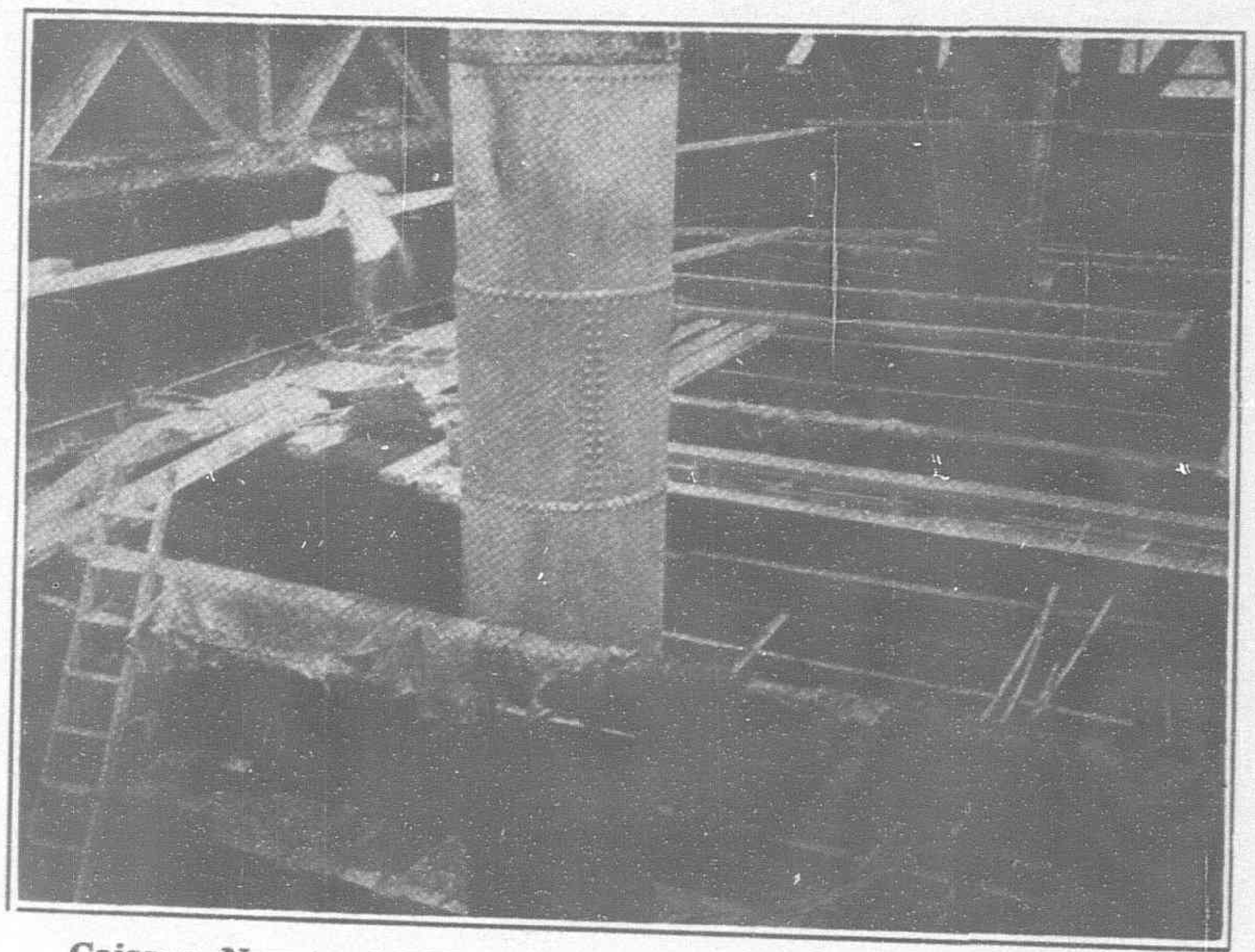
All the 4 piers are carried down to the same depth, viz., approx. —27 m. M.S.L. and are similar in details.

As in the abutment the base of the foundation is solidf or 4 m. Then there are 5 voids left as shown on fig. 11 The two narrow and oblong voids are left mainly for the extraction of the chimneys afterwards. The voids are continued to a height of 8 m. and then a reinforced concrete platform 2 m. thick is cast on top in exactly the same manner as that of the abutment, making the base of the foundation a block 199 sq. m. in section and 14 m. high.

From this point upwards the pier is made in two separate legs, each with a semi-circular end as cut-water. A hole is left in the centre of each leg for the chimney. It should be borne in mind that when the lower block of the foundation is completed, excepting of course the concreting of the working chamber which has to be done afterwards, the base has by on means reached the proper foundation. The two legs are built up little by little to keep the work above highest water level as the sinking operation goes on.

Great care, therefore, has to be exercised to see that the caisson sinks straight and does not tilt, otherwise the axis of the legs will go out of correct position. As has been mentioned before, the caisson is bound to move more or less from the position in which it is placed at the beginning. For this reason it is made large enough to allow for plenty of play one way or another, so that should there be any movements during sinkage the actual axis of the finished pier will still be reasonably near the centre of the caisson.

When the reinforced concrete platform is cast the axis is measured again and marked on it.

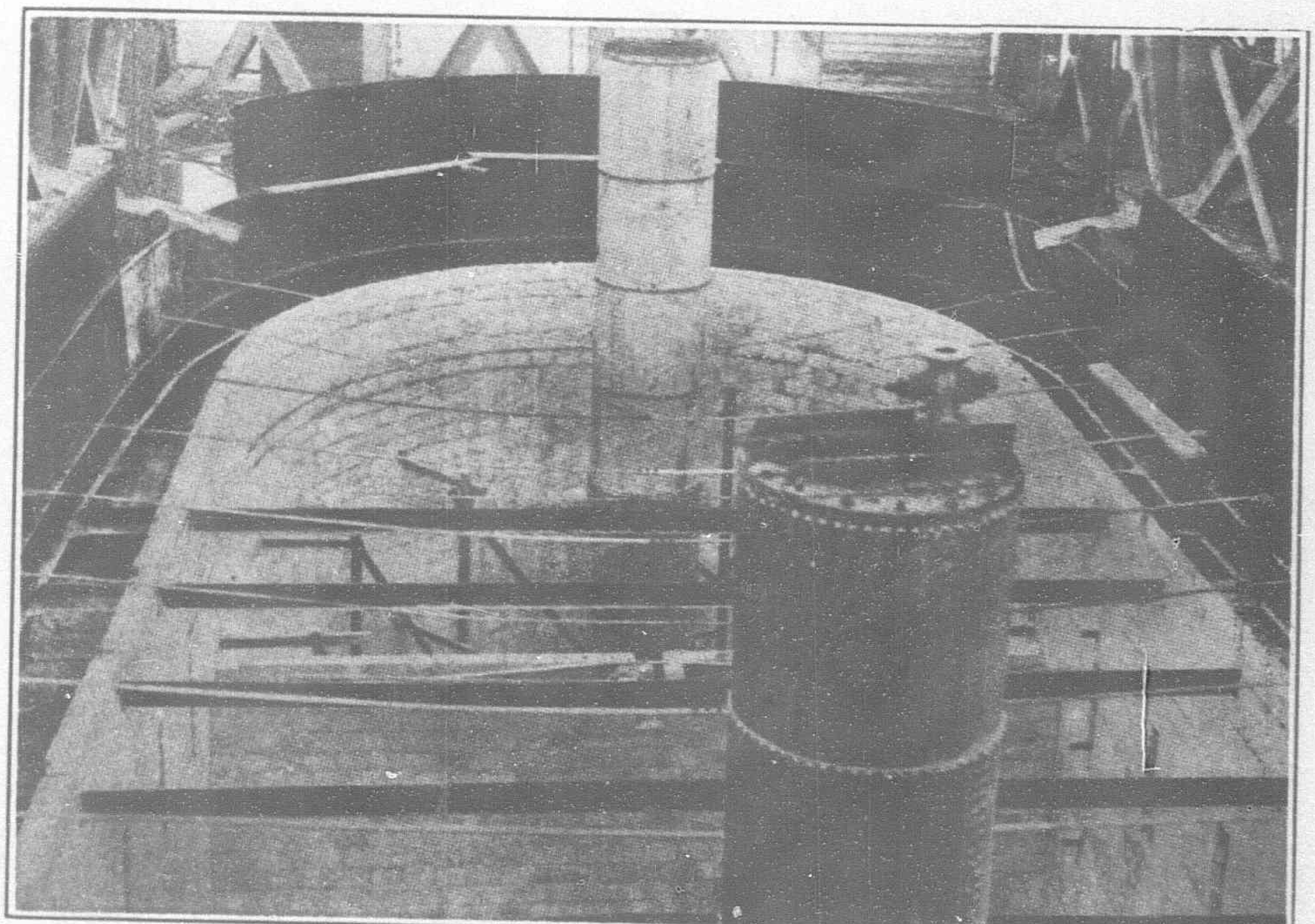


Caisson No. 4. 14 Days After Concrete Work was Started. Note Concrete Wall all Round and Cross Walls for Strengthening Side, also Steel Side Plates which are Added Up.

If there has been any displacement this new axis is taken for building up the legs. In the case of the land piers, by the time the caisson is some 12 m. into the ground there is not much likelihood of it shifting or tilting much. But for the river piers it is another matter altogether. At this stage the knife-edge is only just reaching the river bed and the caisson is only at the beginning of the sinking operation. Great care has to be exercised in the sinking.

Between this lower stage of the legs and the final work above water level there is only a play of 60 cms. allowed for. If any movement occurs greater than this the pier cannot be built to true axis.

The circumference of the leg is built up with 1:2:4 concrete blocks cast for the purpose and the circumference of the hole round the chimney is of ordinary 1:3:6 blocks. The space between this is concreted up with 1:3:6 concrete. The outer blocks are made of richer concrete as they are exposed to the action of water, especially for the river piers. This second portion of the pier is built up to level—1.30 m. M.S.L. (approximately 11.70 m. high). Above this the 2nd. portion of the leg or the 3rd. stage of the pier is erected with specially made blocks. This last portion has to be built exactly to correct axis and it cannot be started until the caisson has been sunk to correct level and the working chamber concreted to ensure that the axis will not move any further.



Concrete Wall Finished up to Level of Top of "Dalle." Note Crosswall and Void into which Water is Pumped to Keep Caisson down after Touching River Bed

As—1.30 m. M.S.L. is almost constantly under water it is necessary to build up a wall of blocks round the top of the leg to keep water out and thus enable the proper blocks to be built up from inside when the time comes

This wall is demolished after the blocks are laid and the 2nd. portion of the pier leg concreted. The concrete blocks for the semicircular end are cast hollow as the corner blocks, but they have a smooth surface instead of being rough.

This portion of the leg slopes upwards and therefore the radius of the circle is less from tier to tier and the moulds for these blocks are different for each tier. They are carefully made of teak and each curved portion is sawn out of a solid block. The distinguishing mark for each block is cast on the inside. For the straight side ordinary surface blocks as used at the abutment are employed. The inside corners are built up with corner blocks having rough surfaces.

On top the two legs are connected up by an arch as shown. The arch stones also have rough surfaces (side and bottom) similar to the corner blocks.

The crowning work as well as the concrete under the bearing plates is of reinforced concrete work. The arch stones are erected on timber staging as shown on Plate.

Placing Caisson of River Pier in position.

To place the caisson of the river pier in position is not as simple a matter as the placing of the land pier. The river is about 14 m. deep and there are tides and river traffic to be considered.

For this work a floating plant is used. It consists of two steel barges each 37 m. long and 6 m. broad connected together by timber false work. The space between the barges is just large enough to allow the caisson to be moored within. On top of the timber false work are placed 4 steel girders having the ends slightly over-hanging the inner side of the barges. Each girder is made up of 2 I beams 13 cms. wide and 32 cms. high placed side by side. On the end of each girder is placed a 30 ton screw jack specially made for the purpose it has to serve.

The bearings on which the jacks rest are made so that a jack can swing in any direction out of its vertical position without being under any strain. This is necessary because the caisson is bound to move relatively to the floating plant, if only a little.

The lowermost base of the jack marked "A" rests on a set of stiff conical springs which in turn rest on the I beams. "A" is kept from moving laterally by bolts which pass through the springs but the top nuts are not screwed down tight, the spring being allowed to rise to full height when there is no load on the jack. The next piece "B" rests on "A" and rocks in one direction. "C" comes on top of "B" and can rock in a direction at right angles to "B." Thus the two combined, give full freedom to the jack to swing in any direction. The jack itself rests on a set of ball bearings "D" which fits into the top of "C." This makes it easy to turn the jack.

The diameter of the screw is 10 cms. and the pitch 2 cms.

Four steel brackets "M" corresponding in positions to the 4 jacks are attached to the working chamber which is connected up with the jacks by means of links "J" from these brackets.

The links are alternately double and single and are connected together by means of pins through the holes at the ends. Thus the caisson is attached to the floating plant and part of its weight can be taken up by the barges. These jacks are not meant to hold up the entire weight of the caisson but only a small part of it. They are fixed in order that the caisson may be controlled and kept from tilting.

The caisson is arranged so that it can float by itself at all times until it touches the bed of the river. The side plates are added up and the concreting is done round the sides and at the bottom in stages so that the caisson can float by itself and yet have the wall and the base sufficiently reinforced by the concrete against hydraulic pressure.

The jacks are kept just tight and are let down from time to time as the concreting proceeds to allow almost the whole load to be borne by the buoyancy of the water. The amount to be let down is calculated from the volume of concrete placed inside the caisson. The cross-section of the latter is 199 sq. m. and therefore 1 m. height of it will displace 199 tons of water. Taking the specific gravity of concrete as 2.2 then 1 cubic metre of it will make the caisson sink approximately 11 m/m. Concrete blocks are largely used in this operation.

The barges are strengthened with concrete at the bottom and with strong timber struts so arranged that the loads from the false work on top are well distributed over the whole barge. On the lower platform are placed 3 air compressors, 2 electrically driven and the other driven by a petrol motor. This latter is an emergency one in case the electric supply fails. The rest of the space is divided into stores and quarters for the men who look after the floating plant. On top of the false work a timber platform is laid over the two barges leaving a hole in the middle where the caisson is to be erected. Two timber derricks are erected on each side of the plant for hoisting up materials etc. by means of electric winches. A concrete mixer, water tank for the compressors as well as for concreting, cement storage shed and offices are all on this top floor.

Sand and cement are transported from the shore by large boats which are moored along-side the plant and under the derrick " A." The required amount is taken up in tip buckets and is tipped directly into the receiving hopper of the mixer. For the stone the bucket is perforated with holes all over the side and bottom and the stone contained therein is dipped into the river from 3 to 5 times to wash it before it is used.

The mixed concrete is poured into another tip bucket on a trolley frame and run over a koppel track to derrick " B " which picks it up and sends it down to be tipped on to a platform in the caisson below. From this platform the concrete is carried by hand to the places required. Derrick " B " is so placed that it can also be used to pick up material from boats along-side the floating plant. Along the two inner edges of the platform rails are laid, on which runs the travelling crane used for the purpose of fixing chimneys and air locks to the working chamber. In order to fix the floating plant and caisson in the correct position anchors are dropped at definite places.

At first a small boat is anchored in the correct position for the pier. Then from this boat the positions of the anchors are set out approximately, the distances being measured by means of a steel wire of known length. The anchors or dead weights, are made of concrete with old rails embedded in them and sticking out. Each has iron loops at the top for fixing to a chain. There are two kinds, the larger ones weighing 2.5 tons and the smaller ones 1.75 tons (in air) each. Anchors Nos. 1 to 8 are the larger ones.

Pier No. 3 was under construction during the flood season of 1924 when the current was strong and was also going down all the time. At this period the caisson was nearly touching the bed of the river and the resistance to the current was naturally very great.

It was found that the anchorage was insufficient. Two concrete anchors were taken away from the down stream side where they were not required and placed up stream, but they proved inadequate. During the early hours of October 15th, 1924 the floating plant with the caisson was carried some 70 m. down stream before it could be made fast. The contractor's engineer decided that the current during that period was too strong to go on with the work of sinking and decided to wait till after the flood. Consequently the floating plant was moved a little towards the east bank of the river and temporarily let down to bear on the bed of the river in order to obtain better anchorage against the current. It was brought back and successfully sunk in its correct position on November 28th. 1924.

Two heavy iron anchors had to be added to make the floating plant fast.

The caisson is kept in position relative to the floating plant in the following manner :—

A belt of wire rope is passed round just on top of the working chamber through the slots in the first suspension links. Four wire ropes are then connected to this belt at the two ends. The end of each is passed round a special pulley attached to the heavy anchors 1, 2, 3, and 4, respectively and is taken back and attached to a winch fixed on the barge.

The caisson can thus be controlled by these winches. When the knife-edge is 7 m. below the water level another similar belt is passed round the caisson (but not through the link) and attached to separate anchors in the same manner.

This belt is moved up to just about water level from time to time as the caisson sinks.

The moving of this belt and the letting down of the caisson are done when the water is still or when the current is not strong so that the caisson may not be subjected to the heavy pressure of the current during the operation. By this means the caisson can be kept from being tilted by the flow of the current.

The lower belt is passed through the slots in the suspension links for the purpose of easy removal.

When the caisson is properly placed and settled on firm ground, a diver goes down to disconnect the last links from the 4 brackets " M." The links can then be pulled up from the top and the belts being passed through the slots will come up with the links.

Further to connect the caisson to the floating plant another belt is placed and kept up outside the water round the top of the caisson. The belt is attached to the floating plant at the 4 corners by 4 sets of pulley blocks.

DIFFERENT STAGES OF SINKING THE CAISSON IN MID RIVER.

The concreting of the caisson has to be done according to a prepared plan in order that the strengthening of the sides and bottom of the caisson by the concrete, and the sinking of the caisson should work together. It cannot be done fully according to the complete plan from the bottom upwards as at the land piers.

First one row of additional plates is put up round the caisson and the knife edge is concreted. Then the floor is concreted 25 cms. thick, followed by a wall of 80 cms. thick and so on. It is so arranged that at no time will the caisson float with water level on the outside more tham 1 m. above the concreted wall inside, and the wall is strengthened by cross-walls and widened out at the base as the caisson is sunk. This goes on until the knife-edge just touches the river bottom at low tide. The caisson is now ready for sinking into the ground.

At the beginning of the ebb-tide when the water is practically still the floating plant is adjusted so that the caisson comes into the right position.

Water is then pumped into the 3 voids (in the caisson) made by the two strengthening cross-walls. The jacks are gradually let down and the caisson allowed to sink into the ground. Sufficient water is pumped in to keep the caisson down at high tide. More concrete is then added to the top of the wall round the caisson until the weight is equal to that of the water ballast. The water is then pumped out and the caisson concreted from the bottom upwards according to the finished plan.

When sufficient weight is obtained excavation by compressed air is begun and the caisson is sunk about 3 m. into the ground in order to get a firm footing. Then the sinking is stopped temporarily until the concreting of the top platform of the caisson is finished. The top of this platform is 14 m. from the knife edge. All plates below this level are left in and cannot be recovered, but the plates that are put up above this level to keep out the water are only bolted on and can be recovered later on.

When the " Dalle " or top platform of the caisson is finished the correct axis of the pier is again traced out and the pier legs proper are built up. As soon as these are above high water level the moveable plates are taken out for use at the next caisson and excavation by compressed air is again started. The pier legs are built up gradually so that they are always above high water level as the caisson sinks. 11.70 m. from the top platform of the caisson at level—1.30 m. M.S.L. the first part of the pier leg stops. From here the 2nd. and final part starts.

This part is smaller and the outside is made of precast concrete blocks with carefully prepared surface to give it a good appearance. This last part cannot be built until the caisson has reached its final position and the chamber fully concreted, because the distance of the centre line must be measured carefully from the land pier. The caisson is liable to be tilted a little one way or another and the correct position cannot be traced before it has been properly sealed up. As level—1.30 m. M.S.L. is nearly always under water level a thin wall of precast blocks is built in continuation of the lower part of each pier leg to keep out the water while the caisson is sinking and to enable the final pier legs to be built up afterwards in the dry.

As soon as the working chamber is concreted and the air locks and chimneys are taken out, the floating plant is moved away in order to start the 2nd. river pier. Timber platform for the concrete mixer and tower for concreting the remaining portion are constructed on the temporary walls round the legs of the finished pier.

From this stage the construction is simple and straight forward. Precast blocks are first laid by masons according to the shape of the pier. These act as formwork as well and the concrete is poured inside in stages up to the springing of the arch.

Timber arch forms in two quadrants are used for building up the arch which connects the two pier legs. Precast arch voussoirs are laid first, followed by the other precast blocks which form the circumference of the pier up to the crown work. Then this latter part is concreted. Finally teak-wood forms for the crown work are put up, reinforcing bars for the circumference of the crown work and for the bearings are tied and the final part of the pier concreted.

The Machinery Trade of China During 1926

Imports Sustained in First Half of Year—United States Secures Satisfactory Share of Trade

THE machinery import trade of China during the first six months of 1926 changed but little in total value from that of the corresponding period of 1925, despite labor troubles, political complications, and civil warfare, according to preliminary unofficial returns of the 45 entry ports under the Chinese Maritime Customs. Indications are also that the United States secured a satisfactory share of this business. Machinery imports amounted to 8,514,284 Haikwan taels,* as compared with 8,584,702 taels for the half year of 1925. As usual, most of this trade passed through seven ports, as follows : Shanghai, 4,105,169 Haikwan taels ; Dairen, 2,887,283 taels ; Tientsin, 657,651 taels ; Hankow, 281,037 taels ; Kiaochow, 229,519 taels ; Harbin, 85,316 taels ; and Canton, 62,448 taels. These figures are gross and included machinery entering into the interprovincial trade as well as net imports.

United States Shares Well in Import Trade

Other preliminary and unofficial figures, which appear to be net, show that the United States secured the largest share of the machinery imports of Shanghai during the 1926 period, followed by Great Britain, Germany, Japan, and Sweden, as follows : United States, 1,070,513 Haikwan taels ; Great Britain, 817,419 taels ; Germany, 297,676 taels ; Japan, 294,481 taels ; Sweden, 58,626 taels. A noteworthy feature of the machinery import trade of Tientsin was the increase in imports from the United States along with those from Germany and Japan, while imports from Great Britain decreased by more than 65 per cent. Imports from other countries into Tientsin were in small amounts and showed negligible changes.

Slight Stabilization Seen in General Business

General business during the first half of 1926 showed a slight stabilization, compared with the corresponding period of 1925, while traffic improved somewhat, opening up some of the stagnant markets of the interior. The continued imposition of burdensome military taxes, however, as well as civil disturbances, restricted trade, and merchants moved cautiously, uncertain of future developments. Notwithstanding these difficulties, customs authorities report larger receipts from both imports and exports for the first six months of 1926 than for the corresponding period of 1925, indicating that China has again upheld its reputation for carrying on trade under most trying conditions.

Shanghai Imports of Machinery Increased Almost Half

The machinery imports of Shanghai for the six months of 1926 registered an increase of 47 per cent over the corresponding period of 1925. This gain was largely attained through greater imports of textile and miscellaneous machinery. The former, which as usual constituted the largest single machinery item, nearly doubled as compared with the first six months of 1925, and also represented a substantial increase over the 1924 period.

A striking feature of these preliminary returns for Shanghai is the virtual disappearance of brewing, distilling, and sugar-refining machinery from the list of imports. This item alone accounted for a value of 1,043,565 Haikwan taels during the first six months of 1924 but totaled only 3,282 taels in the 1925 half-year period, and in 1926 amounted to practically nothing.

The following table of machinery imports into Shanghai is given for purposes of a more detailed comparison of these periods :

Imports of machinery into Shanghai, China

[In haikwan taels]

Class of machinery	January to June, inclusive 1924	1925	1926
Agricultural	16,549	16,543	48,182
For electric-power stations ..	192,138	178,220	97,501
Printing, bookbinding, and paper cutting	436,552	242,013	212,641
Propelling (boilers, turbines, etc.)	217,636	455,793	470,074
Pumps and pumping	71,965	96,707	103,026
For textile industries (carding, color printing, weaving, spinning, etc.)	1,445,650	894,542	1,755,254
Brewing, distilling, sugar refining, etc.	1,043,565	3,282	97
Other kinds, and parts of machinery (including cotton gins and parts of)	1,652,109	906,377	1,418,394
Total	5,076,164	2,793,477	4,105,169

Imports Through Dairen Decrease

The machinery imports of Dairen, valued at 2,678,978 Haikwan taels in 1926 fell considerably below the corresponding six months' periods of 1925 and 1924. The decline in trade as compared with 1925 was mainly through a decrease in imports of miscellaneous machinery and parts, which more than offset gains in certain items such as propelling, textile, and agricultural machinery. A noteworthy feature of the Dairen trade during the past three years is the radical falling off in imports of machinery for the textile industries, from 1,442,401 Haikwan taels for the first of 1924 to 124,892 taels and 228,729 taels for the corresponding periods of 1925 and 1926, respectively.

A table showing imports of machinery into Dairen, by classes, follows :

Imports of machinery into Dairen, China

[In haikwan taels]

Class of machinery	January to June, inclusive 1924	1925	1926
Agricultural	172,530	86,005	124,280
For electric-power stations ..	—	179,472	176,032
Printing, bookbinding, and paper cutting	20,792	69,497	56,811
Propelling (boilers, turbines, etc.)	350,739	359,240	499,591
Pumps and pumping	83,390	109,560	78,053
For textile industries (carding, color printing, weaving, spinning, etc.)	1,442,401	124,892	228,729
Brewing, distilling, sugar refining, etc.	4,471	—	2,795
Other kinds, and parts of machinery (including cotton gins and parts of)	1,919,266	2,169,982	1,512,687
Total	3,993,589	3,098,648	2,678,978

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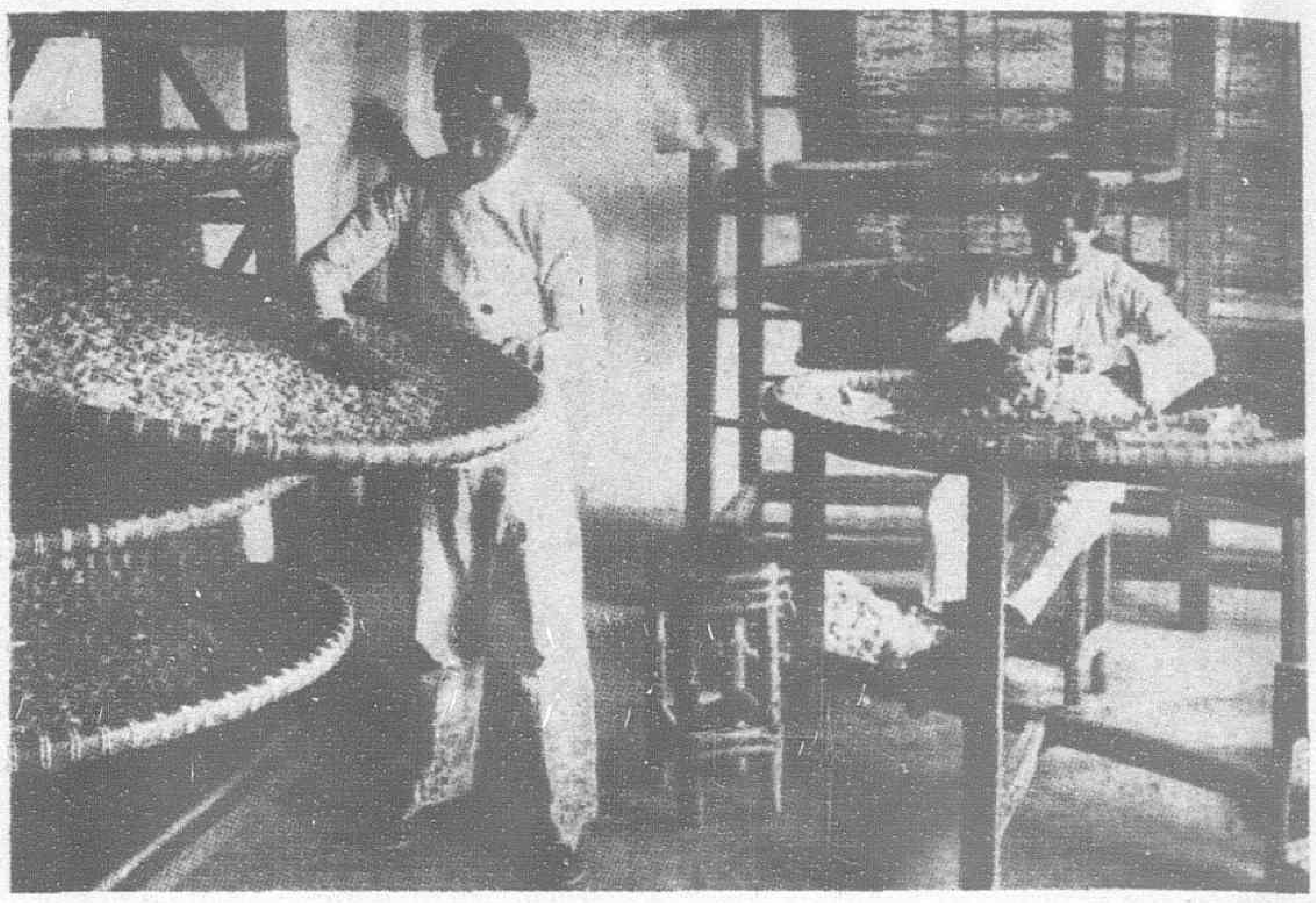
*The value of the Haikwan tael was probably less in 1926 than during 1925, owing to the lower price of silver. No official compilation has yet been made for the current year, however. The quotations for the calendar years 1924 and 1925 were $0.81 and $0.84, respectively.

Selecting Silk Worm Moths and Placing them Under Cones to Deposit their Eggs Preparatory to Examination with the Microscope



Sorting Cocoons at the Canton Christian College so as to Preserve only the most Perfect and Secure Perfect Moths for Egg Laying

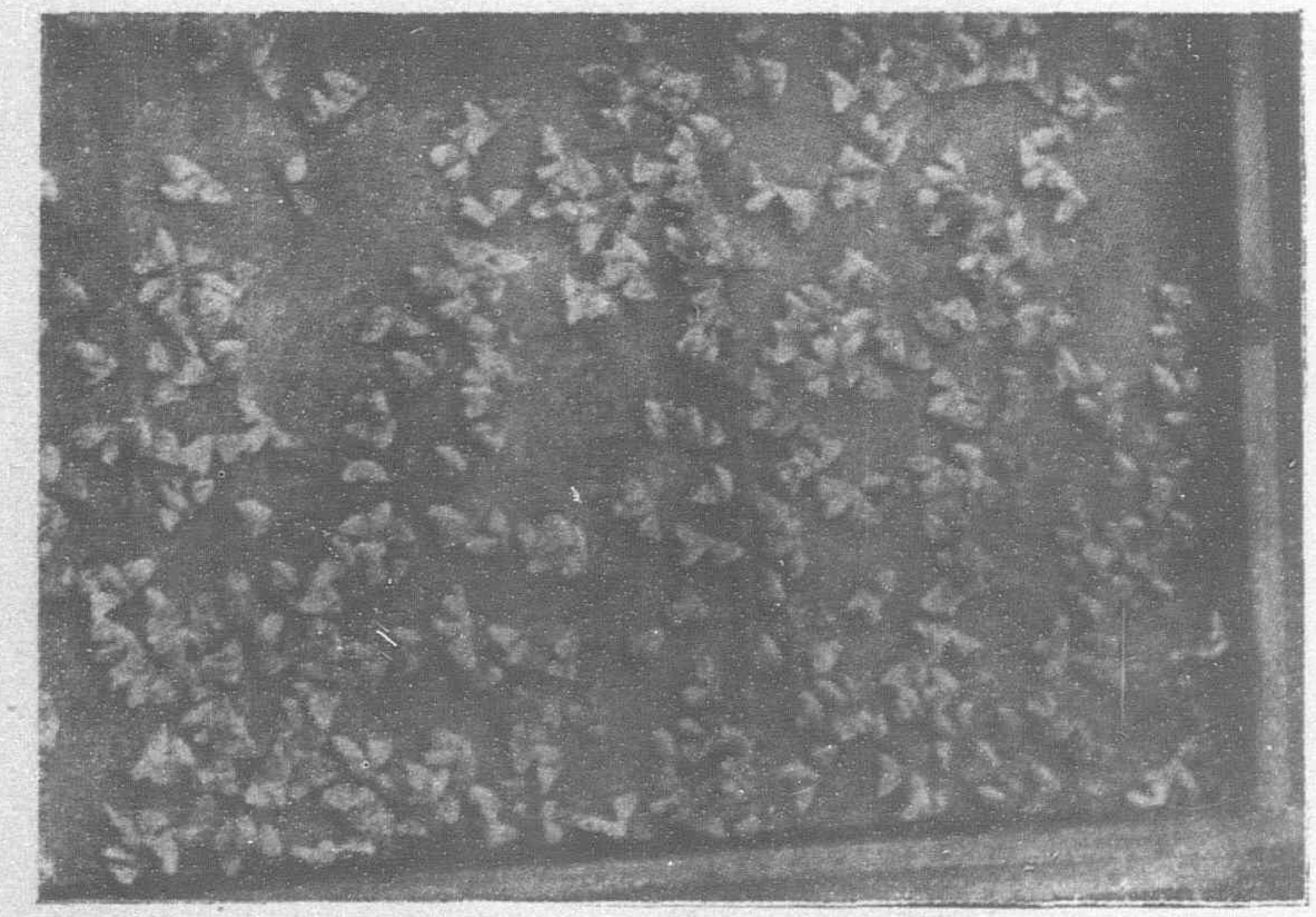
Outlook for China as a Producer of Raw Silk

Progress Has Been Small in a Half Century—Area and Teeming Millions of Population Favor Development—National Character and Political Uncertainties Dominate at Present—Other Difficulties in Way of Expansion

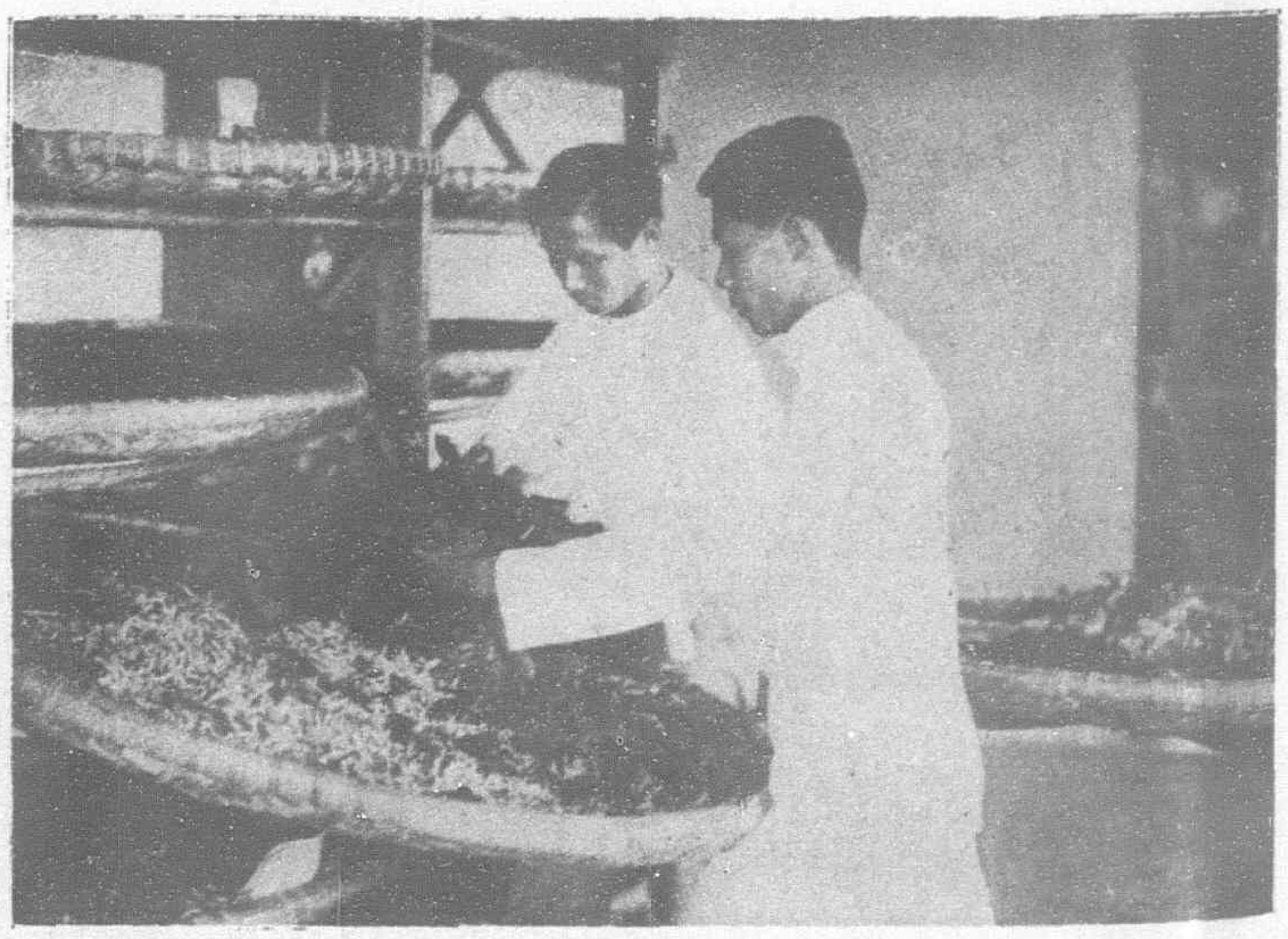
By William E. Spafford

THERE is a tendency, when the question of China's future as a producer of raw silk is considered, to deal in generalities. This is a very natural mistake to make and nearly all of those venturing opinions on the subject have fallen into the same error. The temptation is great to take a broad, general view of the whole question. The usual line of reasoning runs about as follows: To produce raw silk economically and in volume there is necessary primarily a large supply of cheap labor and secondly adequate land to raise mulberry trees. Japan has had both of these factors to aid her in attaining a dominating position in the production of raw silk. Compared with China, Japan's resources of land and cheap labor are utterly dwarfed. Therefore, China, with her vast territory and her teeming millions is the place to look for the future of raw silk.

This viewpoint appeals in its implacable logic. Many have subscribed to the belief that China is the coming center of raw silk production. With some hesitation, therefore, we point out that at the present and for many years to come there will be difficulties in the attainment of this goal. Twenty-five, fifty, or a hundred years from now, China may dominate but it most certainly is a matter of the long range future. For the next decade and for that matter for many decades, if we judge correctly, China will merely serve as an useful aid to Japan in providing the world with its yearly supply of the Queen of Fibers.



Silk Worm Moths Laying Eggs on an Egg Paper Prepared in Native Fashion



Feeding Silk Worms in the Canton Christian College School of Sericulture

The Background

In considering what will happen in the future, it is interesting to review what has happened in the last 50 years. This half century has been a critical one in the history of raw silk which incidentally stretches back many thousands of years to the fabled Empress of China who first discovered the art of reeling raw silk from cocoons. The story of silk over these centuries has been an absorbing romance with adventure and intrigue going hand and hand with the more prosaic details of commerce. The half century from 1875 on to the present day has been momentous in that the former luxury of the few has become the commonplace of the millions.

The greatest part of this growth has occurred in the United States although Europe prior to the World War was also taking larger and larger quantities. In the United States in 1875 we imported and used a few thousand bales only. The actual figure in 1876 was 1,200,000-lbs. By 1900 this had increased to 11,200,000 lbs.; by 1910 to 22,300,000 lbs., and by 1925 to 64,200,000 lbs. In terms of bales we imported in 1926 slightly over 500,000 bales of silk.

The tremendous increase in the imports of raw silk to the United States has been paralleled by the increase in exports from Japan. This extraordinary market has furnished the Japanese with the incentive to increase her exports thirty fold. In the meantime what has happened in China, the country that gave silk to the world in the first place, and which in 1875 far outstripped Japan in the pursuit of the world's markets?

Shanghai District

Taking the exports of raw silk from Shanghai as a basis we find that in 1875 they amounted to 75,300 bales. The exports from the port of Shanghai are used as they are reliable and by the same token good testimony. Shanghai is the port which serves the whole of the northern producing district just as Canton does for the southern district. The exports from Shanghai are larger and embrace a wider variety of raw classifications than those of Canton.

With the use of silk steadily growing in the prosperous western nations, we find that by 1913, the year immediately prior to the war, exports had increased slightly to 85,000 bales. This latter figure, moreover, includes some 20,000 bales of tussah silk which first began to be shipped abroad in the early 80's. Actually in the 35 years intervening which offered every incentive to produce more silk, the exports of high grade steam filatures, or silk that approximated this quality, had declined. Nor is there a different story in the subsequent 15 years which brings us down to the present. During 1925 there were exported 89,000 bales of which about 14,000 bales were tussah so that of white and yellow filature silk only 75,000 bales were sent out of the country. Comparing this total with 1875, the inference is striking. With minor ups and down in periods of high and low prices, the northern district of China has remained just exactly in statu quo.

Canton District

Nor is there any different story to tell as regards the Canton district. In 1913 the Canton district exported 66,900 bales of raw silk. As this year is rather high and the year immediately preceding and following much lower, we will take an average for the three years of 50,000 bales. Over the 13 subsequent years, we find variations in the individual years but no real progress. In 1925 exports amounted to 50,000 bales.

The conclusion to be drawn from these figures is simply this: Over a period of a half century when the world use of silk has increased many times, China has not made any effort to gain her just proportion of the increase. Or if she has made the effort, it cannot be said that her efforts have been crowned with success. With everything in her favor in the way of territory and cheap labor it is interesting to cast around for the reasons for this lack of progress and also to weigh the possibilities of a change.

National Character

First and foremost it is necessary to consider the character of the people and the country. This right at the start has been fatal to any spirit of progress. The cult of ancestor worship, the reverence of the past, the wish to let well enough alone, have been commented on too many times and are too well known to need any repetition here. The basic fundamentals of the Chinese nature over the centuries appear unchanging and unchangeable. This feature is at the same time her weakness and her strength. It has enabled her to preserve her customs and traditions for thousands of years while the volatile nations of the West rose to power and then decayed. It has enabled her to cast off the yoke of conquerors by the simple expedient of absorbing them into her national life.

Political Condition

As a somewhat minor matter we have had to consider the troubled political conditions since the revolution in 1911. A revolution in certain respects may be thought to indicate the dawning of a newer era but not in the case of China where the revolution concerned itself with the few while the real China is the millions. Since 1911, this vast country has fallen prey to military adventurers. The lack of a stable Government, however, is not a pressing matter. The real Government of China is now as it has been in the past in the control of the guilds, village communes, and popular organizations. The supreme Government has always been nominal in that the vast distances, the difficulty of communication, and the lack of any real need for unified control to wage war or treat with foreign nations, have made the central power that of a tax gathering organization almost entirely.

At the same time there has been a rather general spirit of unrest that has expressed itself mainly in the coastal regions in an unreserved hate for foreigners. The Chinese have viewed with some alarm the encroachment of the Europeans, small as it was, and have resented the unfair exactions demanded by the various treaties. These treaties were presumably for the furtherance of commerce, friendship, and navigation but actually they are at the root of the present difficulties. The most favored nation clause places a severe limitation upon China's freedom of action while the principle of extra-territoriality as applied in China is at least open to question as to fairness. The principle of extra-territoriality now applies to places 1,500 miles in the interior of China. What would we in this country do if France, for instance, demanded and obtained a section of Chicago where American laws and authority had no weight—a slice of France in the midst of Americans?

The Currency Problem

Another factor in the way of any real growth in China's export trade in raw silk is the silver basis to her currency. Maintaining her position in the face of a world switch to the gold standard, she multiplies her trade difficulties. Despite the stability of her individual business firms, the fluctuating values of a silver currency place an almost insuperable barrier in the way of any real growth in her export trade. Just what a silver standard has meant in recent years can be judged from the fact that the price of silver has ranged from 50c an ounce to above $1.25 and finally back again. Naturally the small proportion of export business to domestic business makes changes in price levels a slow matter. At the same time, it worked out to the detriment of reelers in the war years. While raw silk prices were advancing in 1917, 1918, and particularly in 1919, the advancing trend to the price of silver and silver exchanges, kept the return of filatures down to modest proportions.

Now that the situation has been reversed in the last five or six years, raw silk interests have benefited. The decline in silver exchange has permitted a higher price in terms of taels or Hongkong dollars. This would seem to be the one favoring factor in the while situation to help raw silk producers to expand their output. To offset the benefits, though, to some extent, there will be a change in the domestic price level which may force slightly higher wages.

Under a fairly stable form of government, we have seen that China has failed to do more than hold her own in the production of raw silk. There is nothing to indicate that she will do more in the troublous years to come. Dealing in generalities, China offers the hope of a new and fertile source for raw silk when Japan finally stops expanding. Viewed in the concrete the expectations have little more than hops to base themselves on.

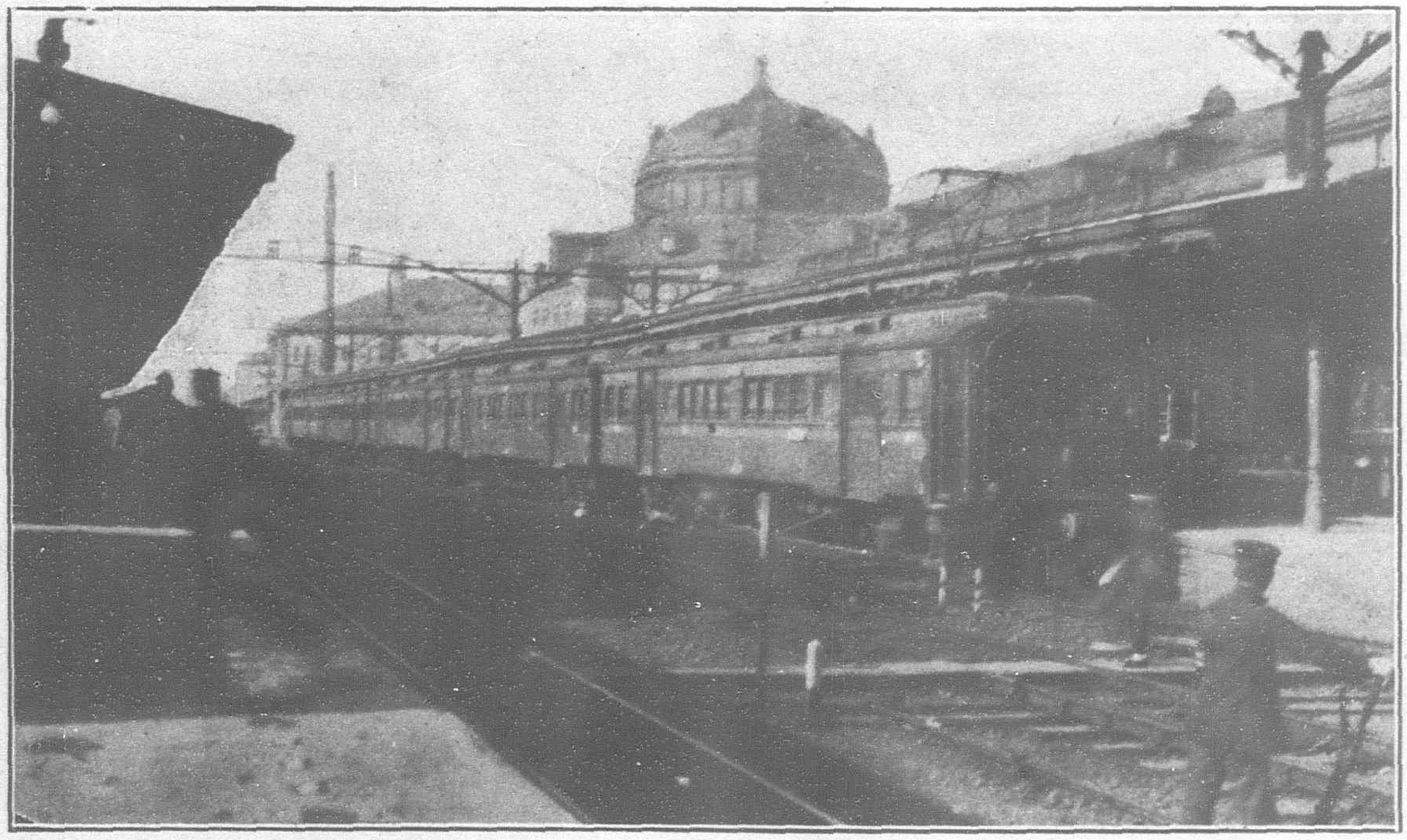
Electrification of Japanese Railways

By Harland L. Walters

JAPAN has approximately 12,217 miles of railroad track, about 8,800 miles of which is on main lines, according to the latest figures available. About 156 miles of the total route have been electrified. The Government railways are at present organized into six administrative divisions as follows: Tokyo, Nagoya, Kobe, Moji, Sendai, and Sapporo. Each division is a complete unit and has a superintendent in charge of it. In these six regions lines under construction total 525 miles and projected lines are estimated at 2,617 miles.

Electrification of Main and Suburban Lines

The electrification of the Government railway main lines was first commenced on that portion of the Shinyetsu line between Yokogawa and Karuizawa, known as the Usui Pass. Within a distance of 7 miles in crossing the pass there is a difference in level of 1,817 feet, producing a grade of 6.68 per cent. Twenty-six tunnels, aggregating 1.8 miles in length, had to be constructed on this line.



Multiple Unit Train Standing at Tokyo Central Station

With the need for more adequate transportation in the metropolitan sections of the country came the advent of electrically operated trains as early as 1905, at which time an 8-mile section of the Tokyo city lines from Mansoibashi to Nakano was electrified. The Yamate and Tokyo-Yokohama lines were developed next. These are equipped with multiple-unit trains of from six to eight cars. The rolling stock of these lines now consists of 371 motor cars and 362 trailers.

One of the most important electric railway services that has recently been inaugurated is that between Tokyo and Odawara, and Ofuna and Yokosuka. Besides furnishing transportation for passengers commuting between Yokohama and Tokyo, the lines now electrified touch at three of the most important summer resorts adjacent to Tokyo, Kamakura, Zushi, Hayama, and Atami.

Railroads Purchase Electrical Energy

At present there are but two Imperial Government Railway power stations in operation, one at Akabane and the other at Yokokawa. A producer gas plant containing four 1,500 kilovolt-amperes, 3-phase English Electric Co. generators, 11,000 volts, 25 cycles, directly connected to Lilleshall gas engines developing 2,163 horsepower was installed some time ago at Yaguchi. This power plant, however, was not successful, because the cost of operating the producer gas plant proved excessive as compared with the cost of electrical power purchased from private companies.

With the exception of that generated by the Akabane plant, all power used in the Tokyo district and in connection with the Tokaido Line, is purchased from private power companies. The total power purchased is approximately 25,200 kilowatts. It is understood that the Imperial Government railways department is contemplating the construction of two new power stations of its own. The main power station, according to proposed plans, will consist of a hydroelectric plant which is to be situated at Shinanogawa. A steam plant with a capacity of 60,000 kilowatts will also be erected at Tsurumi as an auxiliary to the hydroelectric station. It is anticipated that the construction work on the Tsurumi steam plant will be started this month. The approximate cost is estimated at about $8,740,000.

Extension of Electrified Lines

Plans are being made for the electrification of 337 miles of track on the following lines: Tokaido Line, Atami-Numazu, 13 miles, Numazu-Akashi, 300 miles; Tabata-Omiya, 14 miles; and Kokubunju-Hachioji, 10 miles. Steam trains are now in operation over these line; with the exception of the 13 miles betweed Atami and Numazu.

The Tokaido line extensions consist of two separate projects which, when completed, will form one continuous line. The first extension from Atami to Numazu will link the former with the Tokaido main line at Numazu. The 300-mile stretch between Numazu and Akashi is perhaps the most important project yet contemplated since it includes the electrification of one of the heaviest traffic railroad divisions in the Empire. That portion of the Tokaido system now electrified, together with the proposed extension, will serve 16 prominent towns and cities. Three of the most important sea ports are located within its limits, as well as the largest manufacturing centres and some of the most productive agricultural land in the Empire.

Although the electrified portions of the Government Railway system have proved successful and in many respects superior to steam operation, the extension of electrification is still somewhat uncertain, principally because the financial policy of the Government at present, and the future policy of the department in apportioning funds for this purpose, are not fully determined.

Importation of Foreign Equipment—Representation in Japan

The Department of Imperial Government Railways purchased, as a part of the electrification program, 56 locomotives. Of this number, 36 are of British make, 16 are American made, and 4 are of Swiss manufacture. A certain amount of readjustment had to be effected before the English locomotives could be operated on the Japanese lines. In all test runs, the locomotives built by the Swiss and American companies have proved satisfactory.

The domestic manufacture of electric railway equipment has been confined to small capacity machines, transformers, and motors, the large generating and transforming apparatus being purchased abroad. Although considerable progress has been made in Japan in the construction of electrical apparatus and machinery, the general opinion is that Japanese manufacturers have not had sufficient experience to enable them successfully to construct equipment for large generating plants. It is believed that Japan will continue to buy this type of machinery abroad.

In the event a firm wishes to supply material or equipment to the department of railways, it is necessary to establish an office in Japan or to appoint as its representatives some importing firm of approved standing. The latter plan is the course most frequently adopted by foreign manufacturers and exporters in developing sales in that market. In some instances the manufacturer may send his own representative to Japan to act as the technical adviser of the agent.

Asbestos Manufacture in Tientsin

ASBESTOS in China is used to make: (1) asbestos cloth for hats, gloves, shoes, and garments for iron foundry workers, members of fire brigades and glass blowers. (2) asbestos coverings, made by mixing powdered asbestos with other suitable ingredients for covering steam boilers, hot and cold pipes to maintain an even temperature, and (3) asbestos packing, made either of pure asbestos or together with metallic and rubber strands.

Asbestos deposits occur in a number of provinces in China, including Chihli, Jehol, Chahar, Suiyuan, Shansi, Shensi, Szechwan, Hupeh and Kwangtung. The mountainous districts in north-western Chihli, for instance, specially abounds in such deposits. The following list shows the various localities in Chihli, Jehol, Chahar and the Metropolitan Area, containing asbestos mines:—

Chihli: Chifenglin and Chuanshuikou in Yichow; Miaoshutsun, in Laishui; Nanpeishihshan, Tsaochang, Yangmeitung, Shuichuankou and Lunshuichien, in Laiyuan, Yushien; Yuntishan, in Wanhsien, Chenchwantsun, in Linshou, Tsiuputung, in Pingshan, Chinshutsun, and Yenchanglin, in Tsingsing; Hwailu.

Metropolitan Area: Hotzechien, in Changping, Ninhsienlin, in Miyun; Hwaiju; Fangshan.

Jehol: Pingtingshan, Sunchiashangtze, Machiatze and Kwanfangkou, in Chaoyang; Hungshihluan, in Linyuan, Paoshanshih and Erpingtai, in Lwanping.

Chahar: Changpei and Fengchen.

Large scale asbestos mining was first undertaken in North China about fifteen years ago, when several merchants organised a company to work the deposits at Pingtingshan, Machiatze and Kwanfangkou, in Chaoyang, Jehol. The output was shipped to Mukden and sold to Japanese exporters. Previous to that date, asbestos was procured only in small quantities by local inhabitants for wall and roof plastering and the coating and lining of clay stoves, the output from each mine being limited to the local demand. In 1913, the same merchants set up a factory at Chinchow, Fengtien province, and manufactured asbestos packing for the markets, of Mukden, Peking and Tientsin. During the European War, similar factories were started in Tientsin and a supply of raw asbestos was obtained from new sources, principally from Yichow and Laiyuan, Chihli province, where several asbestos mining companies came into existence.

The pioneer asbestos company in Tientsin is the Tientsin Asbestos Company, founded in 1915 with a capital of $30,000. The company turns out asbestos cloth, sheetings, coatings, ropes and packing. The company's manufactures have been granted likin exemption by the Government.

At present, there are, besides this pioneer company, only three others operating in Tientsin, all organised after 1918. Of these, the Tientsin Asbestos Company is the largest, employing 30 workmen and turning out yearly about 70,000 catties of asbestos products. The Chun Hwa Asbestos Mfg. Co. employs about 20 hands with a yearly output of 30,000 catties. The Jui Kee Asbestos Mfg. Co. employs 15 hands with a yearly output of 20,000 catties. The Hsin Chang Asbestos Mfg. Co. is engaged principally in manufacturing asbestos fibers.

In making asbestos rope or yarn motor-operated machinery is employed by some of the larger works in Tientsin, while the sheetings are turned out by hand-operated presses. The Chun Hwa Asbestos Mfg. Co., though operating on a small scale, turns out the same asbestos products as those of the Tientsin Asbestos Mfg. Co., while the output of the Jui Kee is limited to sheetings and coatings and that of the Hsin Chang, to fiber only. These products are sold chiefly to Japanese exporters, of whom there are about half a dozen in Tientsin.

The raw material consumed in the Tientsin works is obtained from the mines at Yichow, Laiyuan, Changping and Chaoyang, of which Laiyuan is particularly noted for its asbestos production. The deposit, covering a total area of over 100 square *li*, is worked by four companies: *i.e.* the Hwa Pei Asbestos Mining Company, the Hsing Mou Asbestos Mining Company, the Hsin Chang Asbestos Mining Company, and the Li Ya Asbestos Mining Company. The miners are recruited from the local peasant class and the output, consisting of both asbestos blocks and short fibers, are shipped to Tientsin either by railway or by junk through Paoting. The Tientsin Asbestos Manufacturing Company and the Hsin Chang Asbestos Manufacturing Company, being better financed, maintain a mining department of their own at the places of production, while the other two have to buy their supply from the mining companies.

Asbestos products are sold by the pound, but prices vary with the quality as well as the kind of manufacture. The following quotations were current on the Tientsin market in the middle of December, 1926:—asbestos cloth, coarse variety, 22 cents a pound; asbestos cloth, fine variety, 55 cents; asbestos "drills," 35 cents; asbestos cloth reinforced with copper wire, $0.90—$1.40; asbestos paper, thin variety, 75 cents: thick variety, 70 cents; other varieties, 25-38 cents; asbestos tile, 18 cents; millboard, asbestos belting, 25-55 cents; lubricated belting, 45-50 cents; asbestos bricks, thin variety, 18 cents, thick variety, 16 cents and large-sized variety, 20 cents; short asbestos fibers, 50 cents; asbestos "velvet," $13 a picul. Unless otherwise mentioned, all the foregoing prices are quoted by the pound.

Asbestos articles consumed by the railways in North China, hitherto imported from abroad, are now entirely supplied by the Tientsin works. Considerable quantities of asbestos products are now exported from Tientsin to Japan and a number of home ports including Shanghai, Hankow, Chefoo, Dairen, Yingkow, Kiukiang, Canton and Hongkong. The bulk of exports to Japan consists of coatings and packings.

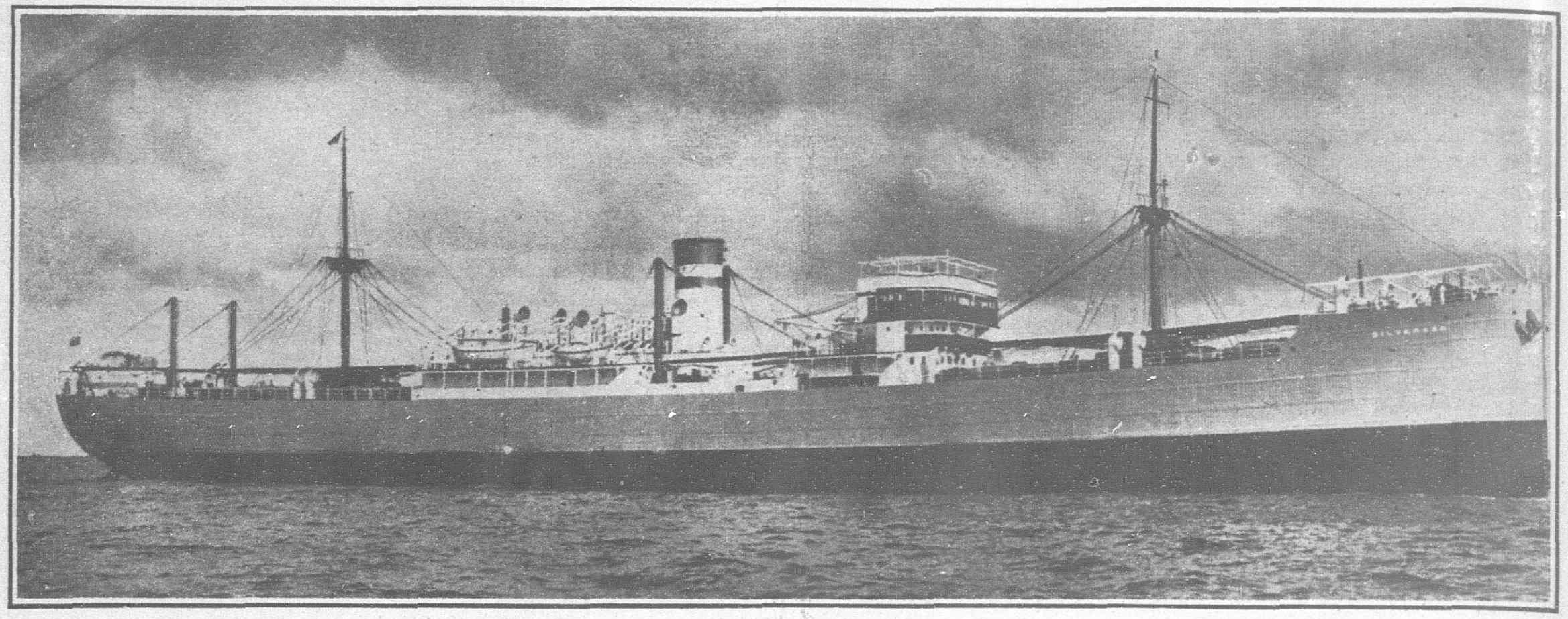
Book Reviews

Greene, Tweed & Co. have recently issued an interesting and remarkable pamphlet on "Economy," which will be sent upon application to Greene, Tweed & Co., 109 Duane Street, New York, U.S.A. The foreword is as follows:

Experience has taught us that there is more to business than money and commodities, and that the thing which makes for real and enduring success is the satisfactory relations that exist between a concern and its customers.

This relation is a state of mind that crystallizes into a firm's fixed policy, and fortunate is that firm which so visualizes its duty to its customers that the quality of its goods and the nature of its service is such as to deserve confidence.

During our sixty years of business we have faithfully endeavored to manufacture goods that have the long service-quality of true economy, and to so constantly study the interests of those with whom we deal, that the confidence and good-will resulting from these years of constantly adhering to this policy is valued by us as a priceless possession.

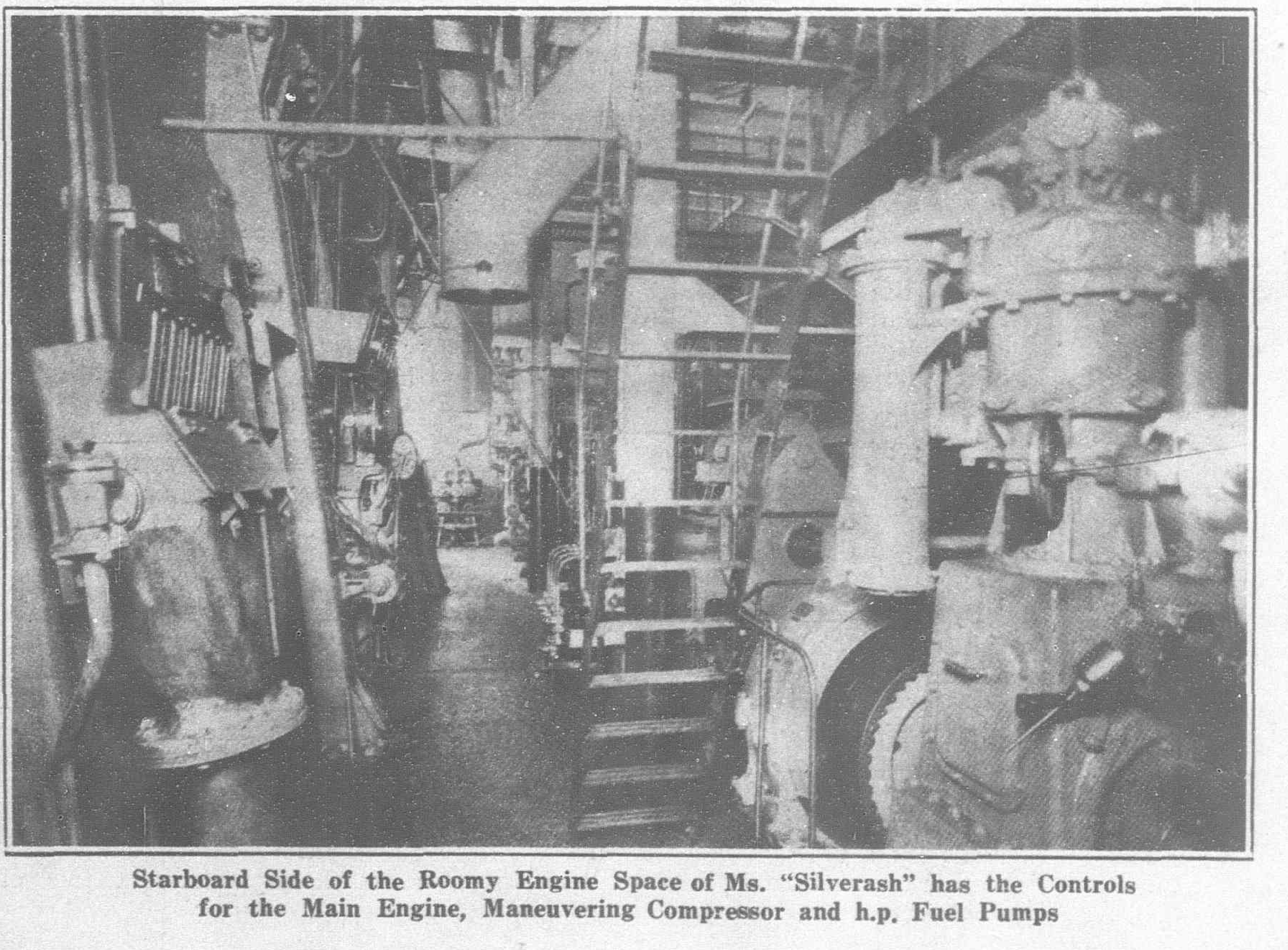


Ms. "Silverash"

Ms. "Silverash," Round-the-World Freighter*

Is First of Fleet of New 14 Knot Motorships Engaged in the Transportation of Far Eastern Cargoes

Ms. Silverash, first of a fleet of six new high-class motor freighters which have been constructed for the service from New York to the Far East maintained by Kerr Lines, Inc., New York, sailed towards the end of last year on her maiden voyage. She was constructed in Sunderland, England, by Jos. L. Thompson Co., and is powered by a 4-cyl. Doxford opposed-piston Diesel, having a normal rating of 5,000 b.h.p. which can be increased if necessary to 5,500 b.h.p. Silverash is expected to maintain a service speed of about 13 knots fully laden, and has been constructed with a view to a maximum speed of about 14½ knots. She and five sisters, four of which are now completing, will thus be entirely suitable to run in competition with the five first motor freighters which were put on the New York-Far East service by Furness Withy early this year. They will replace, moreover, an existing fleet of 11½ knot Kerr Line motorships which are to be transferred from the New York service in which they have been running to the Pacific Coast. Operating from San Francisco and Los Angles to Yokohama, Kobe, Shanghai, Manila, Soerabaya, Samarang, Batavia and Singapore and back, they will constitute a valuable addition to the fleet of well-equipped motor vessels in transpacific service. The maiden sailing of this new service is with Ms. " Silverash " on January 10.



Starboard Side of the Roomy Engine Space of Ms. "Silverash" has the Controls for the Main Engine, Maneuvering Compressor and h.p. Fuel Pumps

Trade from New York to the Far East is of such increasing importance that the most modern means of transportation have to be provided. This the motorship can give. Vessels engaged in this trade load a general cargo at New York, and call for additional cargo at Norfolk and, in the case of Kerr Lines, Savannah, and also at San Pedro. From San Pedro they cross the Pacific straight to Japanese ports, proceeding thence to Manila, which is considered the terminating point of the outward voyage. Here much valuable cargo is picked up, chief among which is latex, and cocount oil in bulk, both of which require special tank holds with heating appliances. Outward cargo is dropped at all points up to Manila and homeward cargo is also picked up. After leaving Manila the vessels proceed to various points in the Dutch East Indies as cargo offers.

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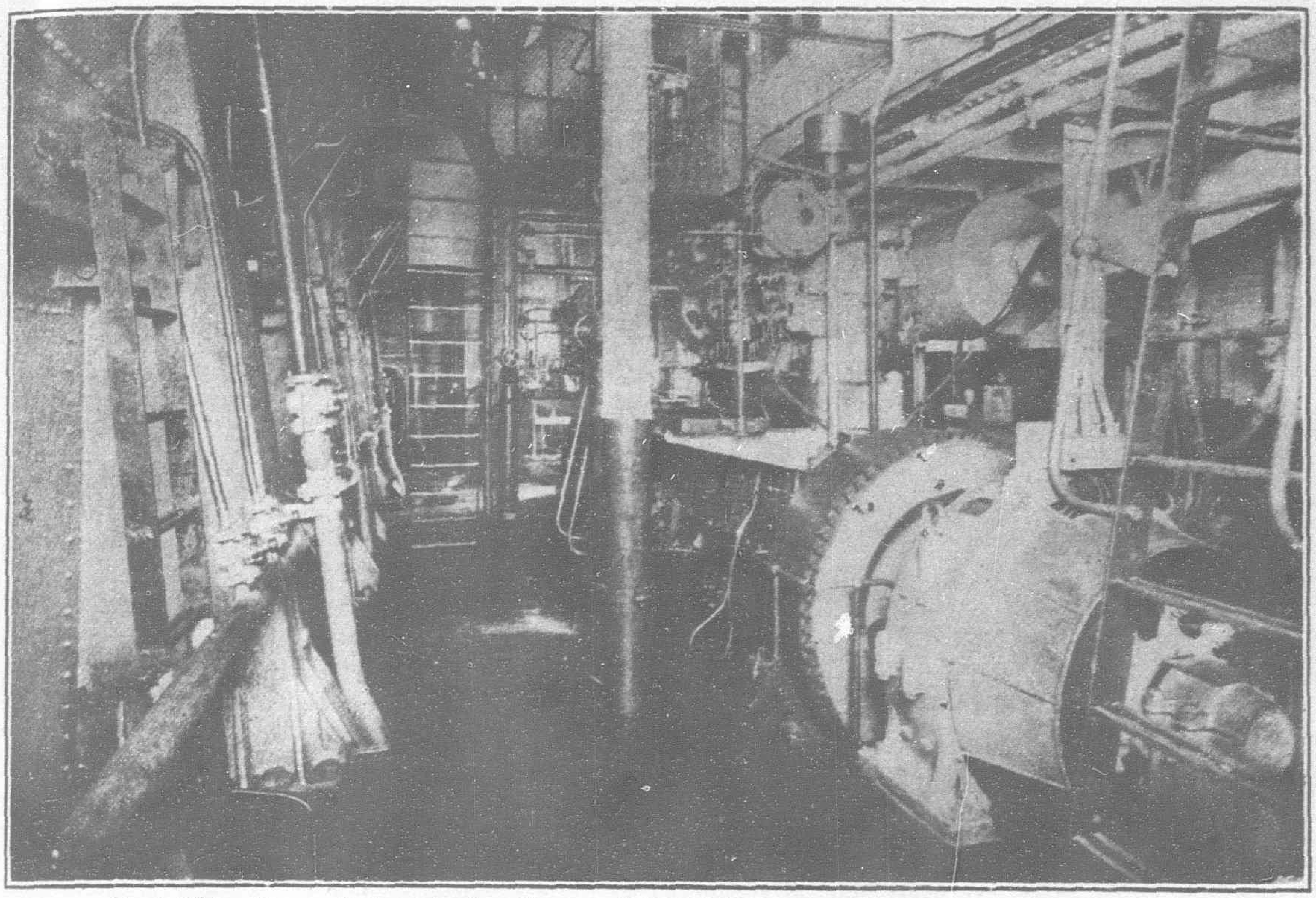
*Motorship.



Port Side View of the Engine Space of Ms. "Silverash" Shows Arrangement of Two Auxiliary Diesel-Generator Sets of 100 k.w.

and then make the homeward voyage back to New York via Straits Settlements, Colombo, and the Suez Canal.

A voyage like this is a long one which includes changes of climate, changes of weather conditions, and is in many ways exacting. It requires, in fact, the highest type of cargo vessel and for this work the Diesel-engined ship is peculiarly suitable. Aside from the superior economy of the prime mover itself, which is no small factor, the smaller bunker space required leaves more room available for freight, while the ease and rapidity with which fueling can be carried out obviated delays other than the time necessitated by cargo handling itself, and here again the efficiency of a motorship's electric cargo-handling appliances does much to speed up the time in which a round trip can be accomplished. This round-the-world service at the present time is one of the most keenly competitive trade routes in existence, and the company which will in time handle the volume of trade is the one which has the most efficient tonnage operating on the route.

Ms. Silverash has been especially designed for and is particularly suited to the requirements of service outlined above. She embodies modern practice in cargo ship construction, and she is an extremely fine example of a modern motorship. We noticed that in her navigational equipment electricity is used to a less extent than on some American-built ships.

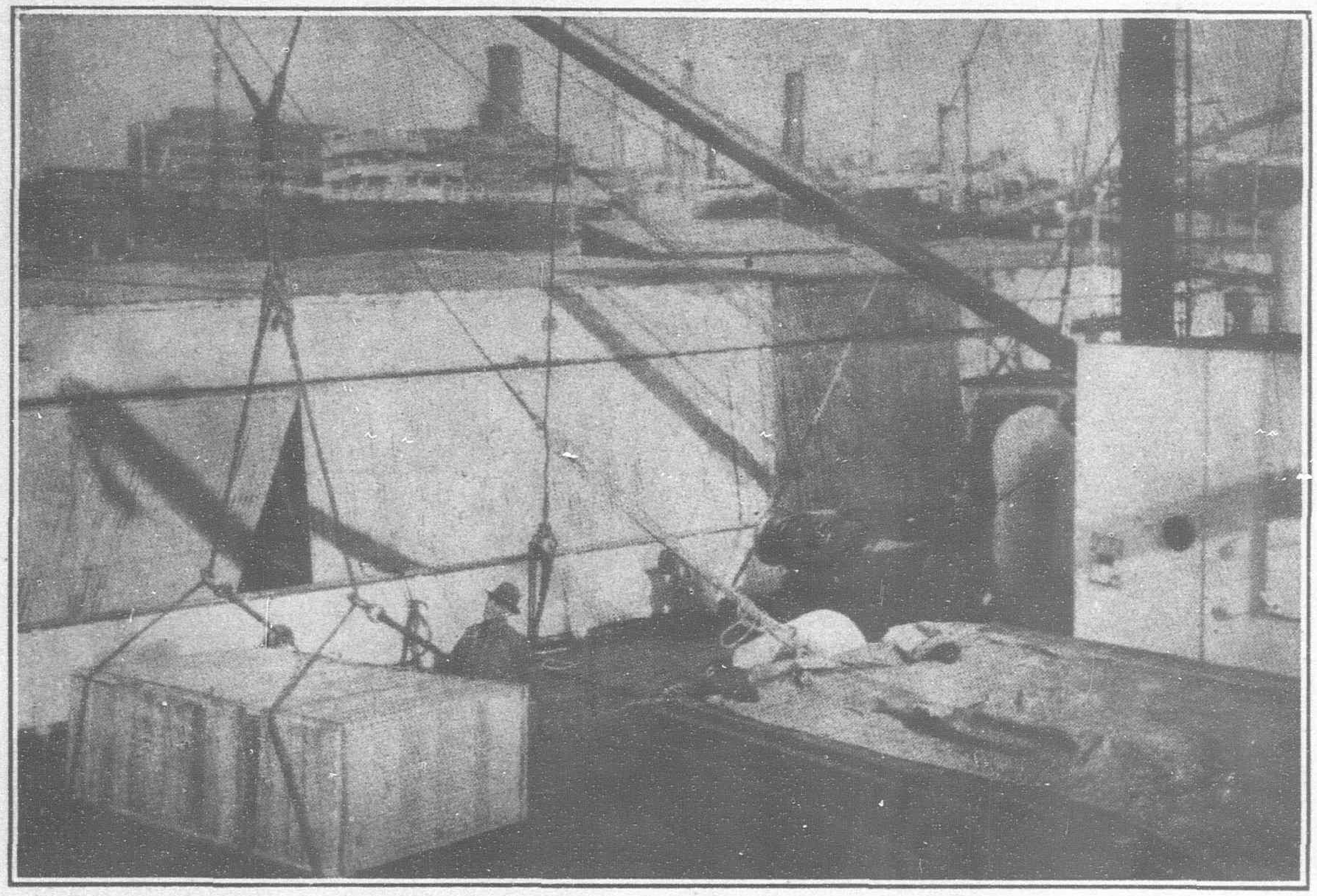
Structurally the vessel is of shelter-deck type, with two tiers of 'tween decks such as is usual in vessels designed for Far East trade. The upper 'tween decks are continuous all fore and aft, while the lower 'tween decks are continuous to the forward deep tank bulkhead and aft from the aft machinery bulkhead. The construction is of the conventional transverse system of framing with cellular double-bottom all fore and aft increased in height in way of the machinery space. Strong built pillars are arranged in each of the holds and there are also fore and aft girders under each of the decks.

Eight watertight bulkheads divide the ship into nine compartments, which respectively from forward are the fore peak tank, No. 1 hold, No. 2 hold, Nos. 3 and 4 holds, which are deep tanks with a centerline bulkheads, the machinery compartment, No. 5 hold, No. 6 hold, and the aft peak tank. The fore peak tank has a capacity of 244 tons of water ballast, while the aft peak tank holds 328 tons of water. Water ballast and fuel oil are also carried in six double-bottom tanks under each of the holds, with capacities of 127 tons, 319 tons, 308 tons, 360 tons, 226 tons, and 76 tons respectively, making in all a total of 1,416 tons and totalling, including peak tanks and the two deep tanks, 4,226 tons.

Characteristics of Ms. Silverash

Length b.h.	425-ft. 0-in.
Beam extreme	58-ft. 3½-in.
Depth, molded to shelter deck	38-ft. 6-in.
Depth, molded to second deck	29-ft. 0-in.
Deadweight	9,000 tons
Draft at above	25-ft. 5¾-in.
Freeboard	3-ft. 10-in.
Gross tonnage	5,299 tons
Net tonnage	3,091 tons
Capacity of holds (grain)	264,835 cu. ft.
Capacity of holds (bale)	243,408 cu. ft.
Capacity of tanks and 'tween dks. (grain)	361,128 cu. ft.
Capacity of tanks and 'tween dks. (bale)	324,032 cu. ft.
Power of main engine	5,000 b.hp.
Service speed (loaded)	13 knots.

A Shipment of Vacuum Oil Loaded at New York



Automobiles are Part of "Silverash's" First Cargo

Of the watertight bulkheads, all are continuous to the lower 'tween decks. There is a wood lining on the side of the fore peak and deep tank bulkheads facing Nos. 1 and 2 holds, this presumably being to prevent any damage to delicate or valuable cargoes through any leakage from these tanks. Similar wood lining is arranged on the face of the aft peak bulkhead which faces No. 6 hold.

Shelter deck is continuous, of course, all fore and aft, and has a tonnage opening 21-ft. long and 4-ft. wide at the aft end. Five hatchways, each 21-ft. wide on this deck, take care of the holds. Each hatch is operated by two electric winches of the type illustrated elsewhere in this article. It will be observed that these winches are not lifted clear of the deck as in the recent Shipping Board conversions, but that they are fixed at the inner ends of each of the hatchways. There are 11 winches in all.

There are on the foremast five 5-ton wooden derricks and one 10-ton steel derrick. Two king-posts abreast the stack amidships each hold a 5-ton derrick, while the main mast has a similar arrangement to the foremast and abaft this again is another pair of king-posts each with a 5-ton derrick. Ms Silverash is thoroughly well equipped, therefore, to take care of any kind of cargo she is likely to be called upon to handle.

Accommodation for the crew is provided in a topgallant forecastle, an arrangement which in some ships has been altered in favor of crew spaces amidships underneath the deck containing houses for the officers. In Silverash, light, airy and comfortable accommodations for captain and navigation officers are arranged in a house forward of the deep tank hatch. This contains on shelter-deck level comfortable cabins for chief, second and junior officers, and a well-fitted saloon. On top of this house is the captain's accommodations and a passenger cabin labelled " Owner's Room," while on top of this again is the chart house and pilot house. This contains telemotor steering gear actuating an electric hydraulic ram gear at the tiller head in the steering gear house aft. Here also are an ordinary standard compass and the necessary engine room telegraphs which are of chain and dial type. The charthouse is constructed of teak with sliding side doors. Large windows permit of easy vision ahead.

Engineer officers are berthed in side houses on the shelter deck alongside the engine casings. Cabins are provided for a chief engineer, 9 assistants and an electrician. Here are also engineers' mess, quarters for four cadets, the refrigerating machine and cold storage rooms for vegetables and meat, in addition to the storage space for CO_2 bottles for the Lux fire extinguishing system. A small structure aft houses the steering gear which we have alluded to already and contains the electricians' store and paint room.

The main propelling engine, comprising a 4-cylinder opposed piston Doxford Diesel, with cylinder diameter 26¾-in., and combined stroke about 107-in., is located slightly abaft amidships. The scavenge pump for the main engine is arranged centrally between the pairs of cylinders and air is taken in from a special intake on top of the midships house. As the illustrations indicate the machinery space is roomy and advantage has been taken of this to make an efficient layout. All the auxiliary machinery is electrically driven, and there are for supplying the necessary current three-100 kw. generators, each driven by single-acting 4-cycle Diesels of B. and W. type. Two of these are located on the port side and one on the starboard side. On the port side are arranged work shop machinery, a general service pump, bilge pump and oil fuel transfer pump. Here is also a vertical heating boiler of 500 sq. ft. heating surface, with its necessary auxiliaries. On the starboard side there are two maneuvering air compressors. These are Weir 3-stage units, one driven by a 90 h.p. motor and the other by a 50 h.p. motor, each running at 350 r.p.m., the former compressing 300 cu. ft. of free air per min. to 600 lb. per sq. in., and the smaller dealing with half this quantity.

The starboard wing of the engine room contains also an auxiliary high-pressure fuel oil pump for the main engine, two jacket water pumps of vertical type with the main motor directly above the centrifugal pump. The motors are 30 b.h.p. units running at 975 r.p.m. and having a capacity of 200 tons per hour.

At the forward end of the engine room on the starboard side is the third 100 kw. generator, two forced lubrication pumps, a sea water pump, circulating water pump for the generator sets, another jacket water-cooling pump and a piston water-cooling pump.

The main switchboard is situated on the starboard side of the ship, parallel to the ship's side and near the third 100 kw. generator. An emergency compressor generator unit is arranged at the forward end of the engine room alongside the bulkhead.

Sharples centrifuges are provided to take care of both fuel and lubricating oil, there being a battery of three machines for this purpose, two of which deal with fuel oil and one with lubricating oil. These are arranged alongside the thrust block on the starboard side of the thrust recess.

The exhaust gases from the main and auxiliary Diesels are used for heating purposes. Gases from the main engine pass through an exhaust heater on their way to the stack, and those from the auxiliary Diesels pass through an auxiliary wasteheat boiler, 3-ft. in diameter and 10-ft. 5¼-in. high. The overall length of engine room is stated to be about 62-ft., which includes the 13-ft. of thrust recess.

Sugar Production in Formosa.—The second official estimate of sugar production in Formosa for the year 1926-27 places the output of centrifugals at 6,814,582 piculs (say 405,600 tons) and that of brown sugars at 163,864 puculs (about 9,800 tons).

Should this estimate prove justified, the decline in production of centrifugals as compared with the previous season will amount to over 1,300,000 piculs (73,600 tons).

The decrease is mainly due to a falling off in the area planted with cane, owing to the competition of rice. The cane area for the present season is stated to be only 95,355 ko (228,852 acres) as compared with 108,897 ko (260,993 acres) in that of 1925-26.

Engineering Notes

Arcade to be Constructed at Shanghai, China.—The construction of an arcade is proposed at Shanghai, which will house about 200 stores, according to Acting Trade Commissioner G. C. Howard. The area of the site is approximately 21 *mow*, or roughly 3½ acres, with approximate dimensions of 325 feet north to south, and 400 feet east to west. A square of buildings accessible to 4 roads, will form an inclosure within which 6 blocks of buildings will be accessible by 9 entrance porches. These buildings will be between three and five stories high, and will be equipped with electric passenger lifts and escalators. On the upper floors there will be a modern hotel, with dining room, grill room, ball room, Chinese tea houses, bath houses, etc.; and on the topmost floors will be apartment houses catering to Chinese business men.

City of Antung to Build Higher Embankment Along Water Front.—The city of Antung, Fengtien Province, China, has decided to build a higher embankment along the water front, reports Vice-Consul A. I. Ward, Mukden. The embankment is to be raised about 6 feet from its former height, which work will involve a period of four or five years. The cost of this undertaking is estimated at 1,500,000 gold yen. (The yen is now worth $0.50.)

Subway Construction in Japan.—It is expected that the subway between Asakusa and Uyeno, Tokyo, Japan, will be completed and opened for operation in July, 1927, according to Howard B. Titus, in the office of the Commercial Attache, Tokyo. To date 6,000,000 yen has been expended on this undertaking, half for materials and half for construction work. (The yen is now worth $0.49.) Plans for the contruction of a subway between Uyeno and Manseibashi, Tokyo, have been completed and the contracts will be let in March. The name of the company to address in this connection is available under reference Japan No. 47002.

Extension of Chinese Railways Proposed.—It has been definitely decided to construct a railway line from Hailungcheng, the terminus of the Mukden-Hailungcheng Railway, now under construction, to Kirin, the capital city of Kirin Province, which is now the terminus of the Kirin-Changchun Railway, and which will be the terminus of the Kirin-Tunhua Railway also under construction. Thus Kirin will be the junction point of three important railways in Manchuria. The length of the line will be about 150 miles and it will touch the two important cities of Pan Shih and Kwan Kai. (Consul Samuel Sokobin, Mukden.)

Five Dams to be Constructed at Osaka, Japan.—A plan has been devised to dam the large streams of the Yodo River and divert the water into the laterial canals, according to Consul E. R. Dickover, Kobe, Japan. There are to be five dams as follows: The Dojima River, 192 feet long; the Tosabori River, 192 feet; the Nagahori River, 120 feet; the Dotonbori River, 120 feet; and the Edobori River, 55 feet. As the engineering department of the city desires dames which can be opened and closed quickly and which will not detract from the scenic values of the city, Taintor gates are to be used in connection with ferro-concrete bridges.

Shanghai-Paoshan Electric Company.—The Shanghai-Paoshan Electric Company is being organized by a group of 16 Shanghai merchants with a temporary office at A112 Peking Road, Shanghai. The company will contruct street car lines to connect the Shanghai and Paoshan districts. The first line to be constructed will be in Chapei, Shanghai, from Jukong Road to Kwangfu Road, and then from Chapei to Wentsaopin, thence to Chenju and Nanziang. The company is capitalized at $1,500,000 at $100 per share, to be paid in 4 instalments, bearing 6 per cent interest per annum. The rate of interest will be increased to 8 per cent per annum when the company is formally open for business. The net profit of the company will be appropriated as follows: 5 per cent as reserve fund and the remainder after paying the 8 per cent official interest on shares to be divided into 14 shares, 11 shares to be appropriated as bonus to shareholders, 1 share as bonus to promoters, and 2 shares as bonus to executives and staff.

A Chinese Trawler.—What is reported to be the first motor trawler built in China was launched at Shanghai recently. It is 125-ft. in length, with a beam of 23-ft. and a depth of 13-ft., the Diesel machinery installation being of 360 b.h.p. to give a speed of 10 knots.

A Singapore-Built Motor Launch for Service on the Tenasserim River.—An interesting motor launch was recently completed at Thornycroft's Singapore yard for service on the Tenasserim River, where she will be used principally for conveying officials of the Austral Malay Tin Company between Mergui and the mines.

In the construction consideration had to be given not only to the climatic conditions, as extreme heat is experienced during the summer months, necessitating a boat providing the maximum of ventilation and comfort, but also to the rough waters which are to be encountered, particularly when crossing the bar at Mergui (Lower Burma) during the monsoon period.

Opportunities for testing her seaworthiness were quickly forthcoming, for on delivery the launch was run from Singapore to Mergui, a distance of nearly a thousand miles, intermediate stops being made at Part Weld and Penang. The Thornycroft 36 b.h.p. engine ran throughout without hesitation, and the bad weather met with during the voyage proved the "Austral" to be an excellent sea boat with a speed of over 9 knots.

The dimensions are: Length 40-ft., beam 8-ft. 6-ins., and draft 2-ft. 6-ins., the displacement being 5.25 tons. The boat presents an attractive appearance, and is of a useful type which might be employed with considerable advantage in other tropical districts.

Petters, Ltd.—Mr. K. D. Campbell, late Sales Manager of the Campbell Gas & Oil Engine Co. Halifax, has been appointed to a similar position with Petters (Ipswich) Limited, Ipswich Works, Ipswich.

Plans for Electrification of Japanese Railways.—The chief of the electrical bureau of the Railway Office, Tokyo, has announced some of the plans for electrifying certain sections of the railways in Japan, including the sections in the Tokyo region between Kozu, in Kanagawa Prefecture, and Numadzu, in Shizuoka Prefecture, and between Kokubunji, in Tokyo Prefecture, and Kofu, in Yamanashi Prefecture; in the Osaka region, the section between Otsu, in Shiga Prefecture, and Akashi, in Hyogo Prefecture.

The electrification of the Otsu-Akashi line will be started in 1929 and completed in 1932, and will involve a total estimated expenditure of 13,000,000 yen (about $6,480,000). The Kozu-Numadzu electrification also will be started in 1929. In order to meet the requirements for electrication in the Kwanto section of the country (the northern half of the main island), five electric power stations will be established. Among these will be a great power station at Shimanogawa, in the Niigata Prefecture on the northwest coast. The estimate for its construction has been increased from 36,218,000 yen to 58,545,000 yen (about $18,055,000 to about $29,185,000).

Although ultimately it is planned to use electric locomotives for both passenger and freight service, until the general financial conditions improve considerably, electric locomotives will be used only for passenger traffic. Owing to the unsatisfactory general financial condition, the work will be spread over a period of about nine years, instead of two years, asoriginally planned.

Shale-Oil Industry in Japan.—At the Fushun Collieries, Fushun, Fengtien Province, late in September, 1926, the first fire was built under the recently constructed experimental shale-oil distillation furnace, and oil was drawn off October 7. In all, 48 furnaces are planned, each to hold 40 tons of oil shale and to be 3 feet in diameter and 50 feet in height. After considerable experimentation it was decided to adopt an internal heating system in preference to the Scotch, and method has been devised whereby the gas will be returned to the furnace and used more than once. An appropriation of about $145,000 was made for the initial undertaking.

Ching Yun Silk Filature at Siaoshan, Chekiang.—The Ching Yun Silk Filature and Manufactory, at Siaoshan, Chekiang province, was reorganised from the Huh Yi Ho Silk Filature in 1923 with a capital of $500,000. The factory covers over 40 *mow* of land. It is equipped with two sets of steam engines of 80 and 50 h.p. respectively. there boilers and about 340 reeling machines of the Italian type, in the filature department. The total daily output is over 3,000 ounces of filatured raw silk, which is mostly yarn of 13 to 15 filaments, and is consumed by the Chinese silk manufacturers and also exported to foreign markets. The raw silk is sold under the Ho Huh brand and the sales are very brisk. In the filature department, over 1,300 operatives are employed at a daily wage of from $0.20 to $0.40. The operatives are all women and girls, who work 11 hours a day. The silk waste discarded by the filature department is sold to other silk filatures for making low grade yarn.

Some of the cocoons used by the filature are prepared by its own cocoon drying plant, which is equipped with over 30 cocoon drying ovens and is capable of preparing several hundred piculs of dried cocoons every season. The balance is imported from Hangchow Shaohing, Tunglu, etc, in Chekiang province. The total yearly quantity of dried cocoons consumed by the filature amounts to between 3,500 and 4,000 piculs. The quantity of raw silk yielded by the dried cocoon varies with the quality of the cocoon. In the case of the 1925 crop, every 500 catties of first grade dried cocoons yielded 100 catties of raw silk. Cocoons of inferior grade of the same year's crop yielded less, the proportion being from 600-700 catties of dried cocoons to 100 catties of raw silk. The crop of the present year is better. Every 500 catties of dried cocoons yields more than 100 catties of raw silk, while the yeild of the inferior quality cocoons in also higher.

The factory has also opened a silk weaving department on its premises, equipped with various kinds of up-to-date machinery, including two designing machines, 14 silk winding machines, 11 silk twisting machines, 40 hand power looms for figured silks and 20 hand power looms for plain silk. With the exception of a few imported from Japan and America, most of these machines are made by the Wu Lin Iron Works in Hangchow and the Sheng Kee Iron Works in Shanghai.

The total daily output of manufactured silk of different varieties is between 50 and 60 pieces of 20 yards each. A part of the raw material is turned out by its own filature department and the balance is collected from the silk farmers in Hangchow and Chuki, Chekiang Province.

The bulk of the silks produced are of new types, known by such new names as " glass gauze" " glass satin," which are consumed chiefly for making ladies' clothing. The silks are dyed by the Shanghai dye works, the factory having has no dyeworks of its own. Most of the silks are marketed in Shanghai, where the filature opened a sales department at Chi Hsiang Li off Shantung Road, International Settlement. About 180 operatives are employed in the weaving department, where a skilled hand such as the designer draws a monthly wage of $40, while a common hand employed in yarn twisting or doubling earns only $7 or $8 a month. The weavers are paid by piece work. A skilled hand power loom weaver can earn $20 a month. All the hands work 11 hours a day.

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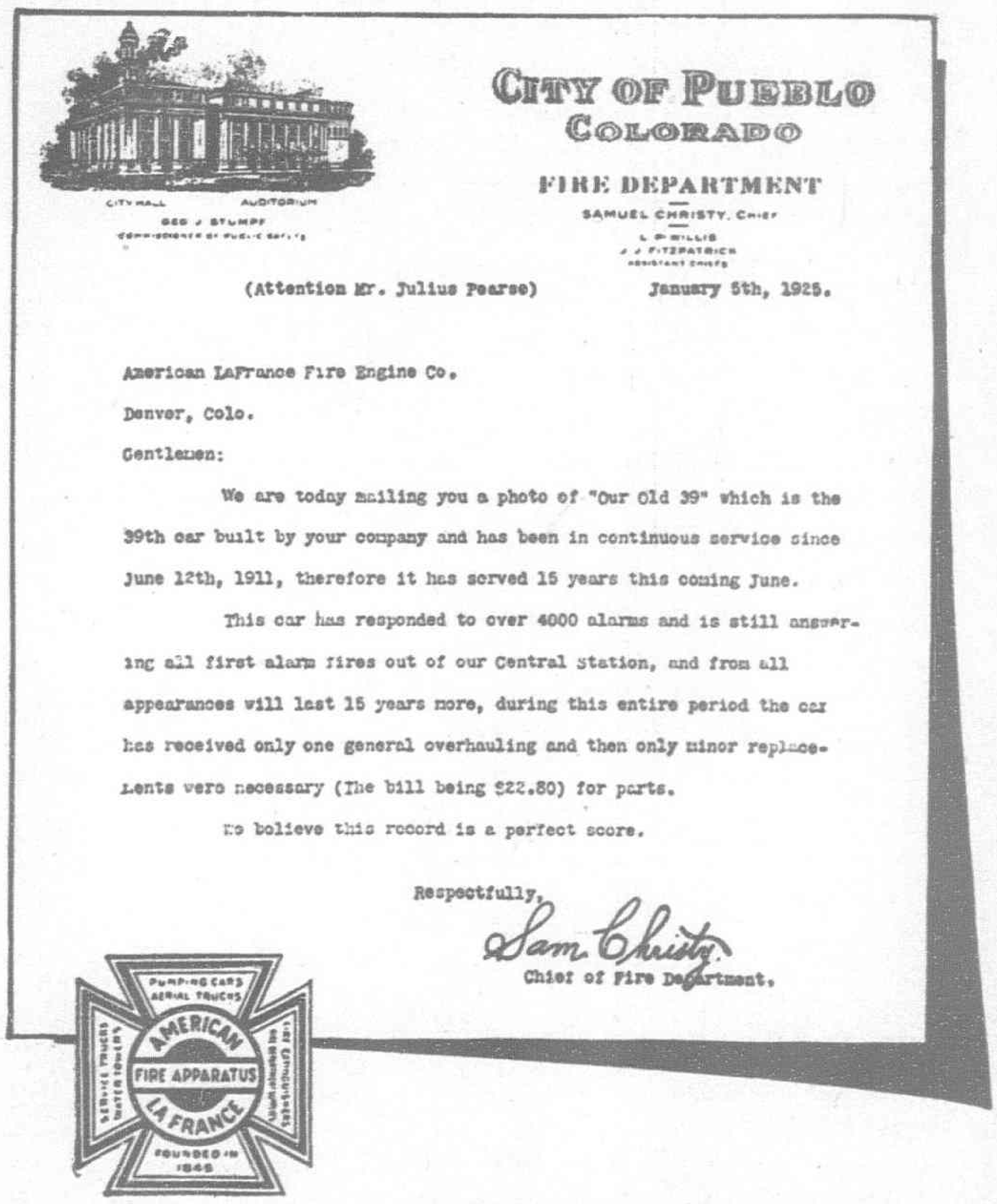

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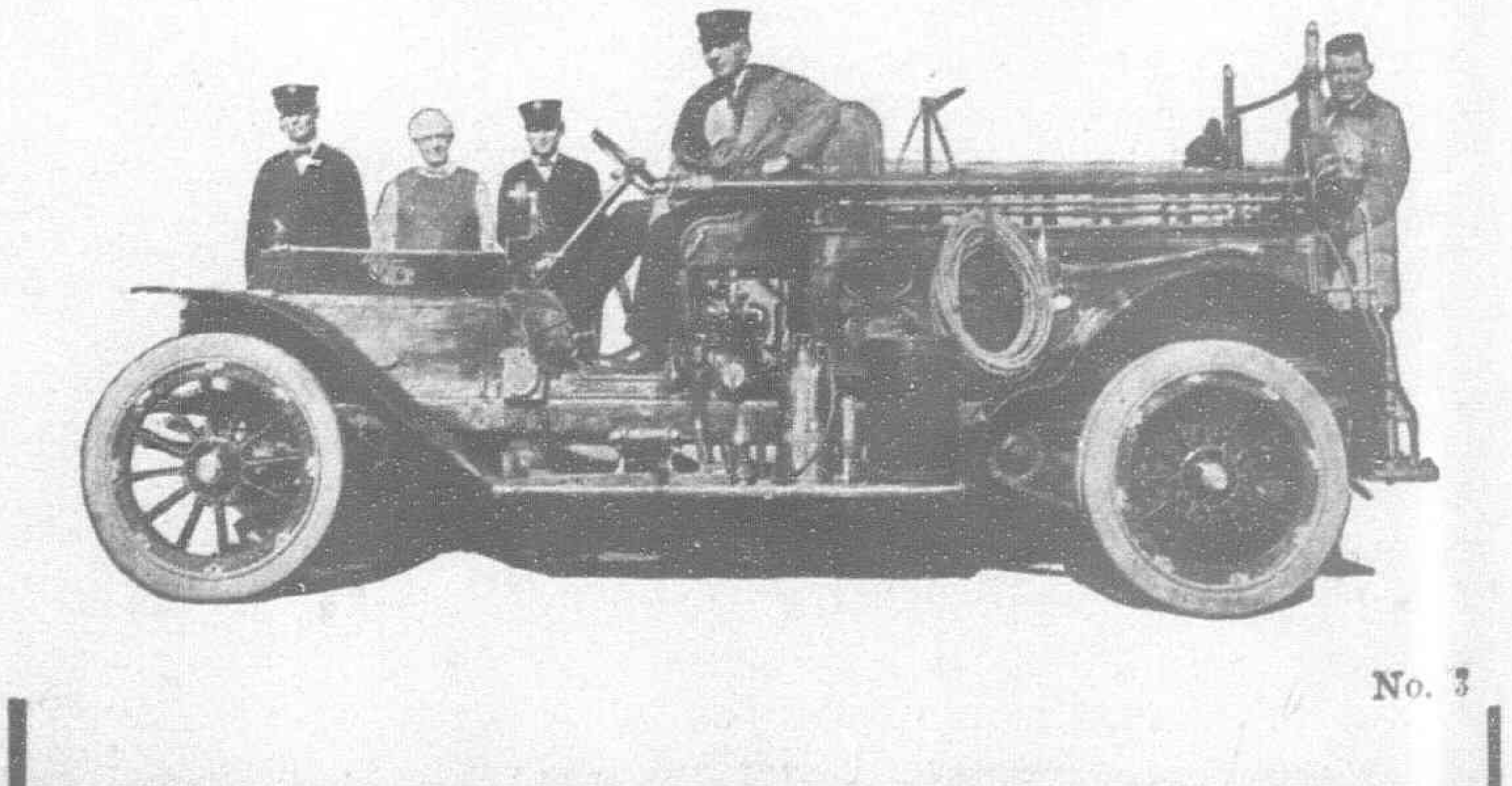


No. 3

C. E. R. Expanding Transportation Business.—The Chinese Eastern Railway has established numerous transportation agencies in Manchuria as well as at other leading ports and cities in China proper. Chinese and Japanese agencies are feeling the competition keenly.

Orders for Sulzer-Engined Ships.—Since the middle of October 1926, the following Far Eastern order has been booked for ocean-going ships propelled by Sulzer Diesel engines :—Mitsubishi, Nagasaki :—2 quadruple-screw liners for the Nippon Yusen Kaisha, Tokyo, each 4 by 8ST68 (total for two ships 32,000 B.H.P.)

Dredger Contract for India.—Messrs. Wm. Simons & Co. Ltd., Renfrew, have just received an order for a powerful Cutter and Drag Suction Hopper Dredger for the port of Chittagong, India.

The Dredger will be constructed under the direction of Messrs. Rendel, Palmer & Tritton, 12/14 Dartmouth Street. Westminster, London, who are the Consulting Engineers for the Chittagong Port Trust.

This Contract, along with other recent contracts placed with this firm, will provide employment for a large number of men during the current year.

New Chinese Grain Hulling Machines.—Ko Chung-chen proprietor and engineer of the China Engine Works, 838-840 Kwenming Road, Shanghai, invented three types of grain hulling machines and a new sieve. Besides these machines, the works also manufactures other sieves. All of the products of the company are sold under the trade mark of "Shen Hsien Lung Kou" or "Angel Grain Hull." One of the machines has a capacity for hulling from 120 to 170 piculs of rice (100 catties per picul) every ten hours and is sold at $650. The life of each mortar is limited to 800 piculs of rice. The manual grain hulling machine with a capacity of hulling from 17 to 20 piculs of rice every ten hours. The sieve, sold at $55.00, can hull 80 piculs of rice every ten hours. The mortars for both electric and manual machines are sold at $16.00 per set of two.

Kirin-Changchun Railway.—The gross receipts of the Kirin-Changchun Railway for 1926 amounted in round figures to $2,600,000, of which about $800,000 was collected from passenger traffic and the remainder from freight charges, it is reported. This amount shows an increase of about $80,000 over the receipts of the previous year and over seven times the 1913 total.

Nanking Wireless Station.—The wireless station at Pehchiko, Nanking, capital of Kiangsu province, has been in operation since November 28. This station is in direct communication with most other stations in the country. Commercial messages cost the same as telegrams. The station is situated on an hill top, and an office is to be built at the foot, and will be connected with the station by special telephone and electric tube.

Waikaremoana Hydro Electric Power Scheme.—The contract for the supply of the valve equipment necessary for controlling the supply of water to the two turbine units, each of 25.000 h.p. has been secured by Messrs. J. Blakeborough & Sons Ltd. Valve Specialists, Brighouse (England) through Sir W.G. Armstrong, Whitworth & Co. Ltd. who are responsible for building the turbines.

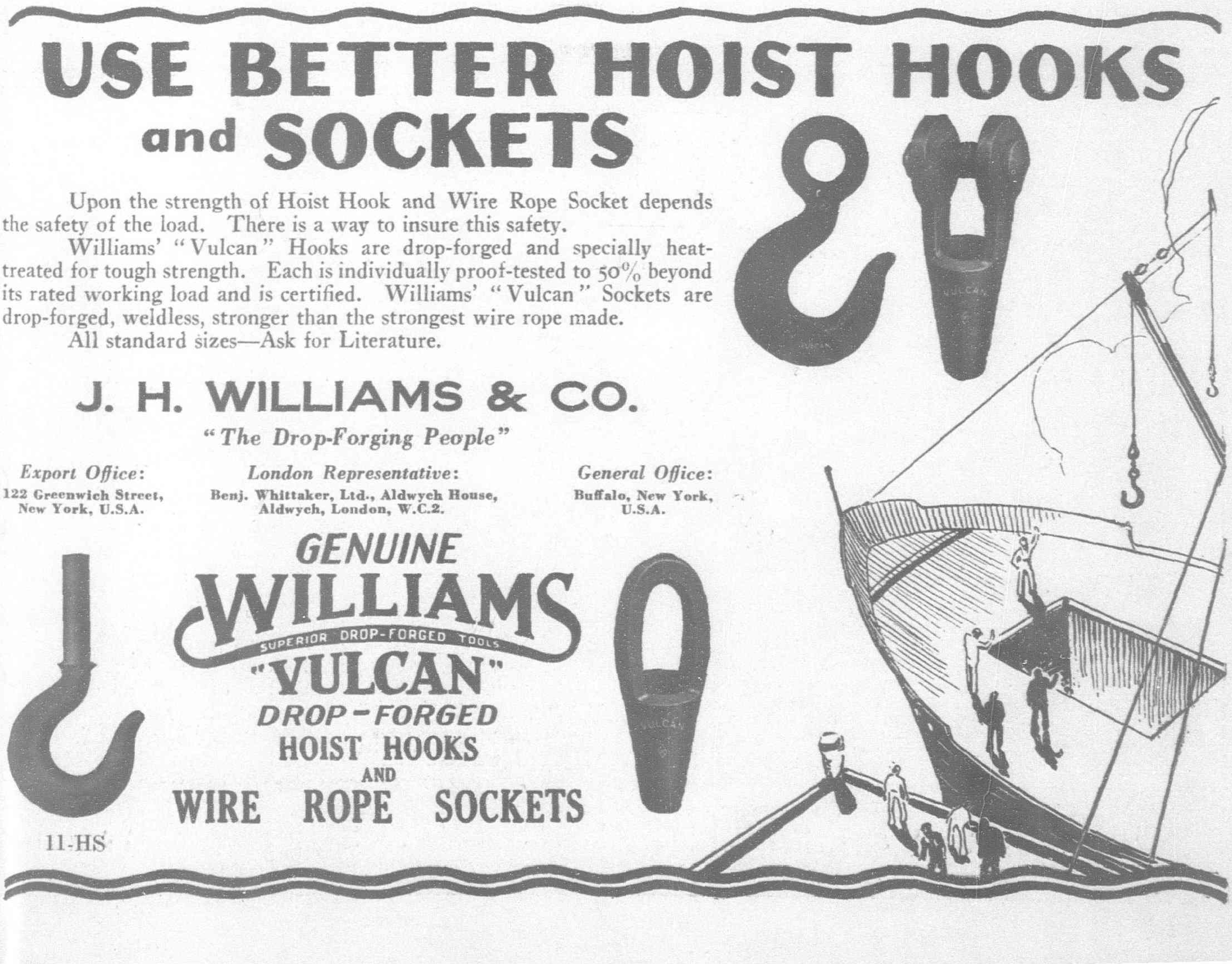
These valves are to be of the Larner-Johnson type with cast steel bodies, the inlet diameter being 66 inches, and the head 645 feet.

Each valve will be fitted with three forms of control, manual, electric automatic and remote, the last being by means of push buttons mounted on the main switch board.

Should emergency conditions arise such as a turbine runaway or burst casing the automatic gear will come into operation, the closing of the valve being effected in 60 seconds.

As a reserve, in case of failure of the current to the operating motor, hand gear is provided which gives control of the valve from the turbine house floor.

Incidentally it may be mentioned that this is the third order for large turbine inlet valves which has been secured by Messrs. J. Blakeborough & Sons Ltd. from the Public Works Dept. of the Government of New Zealand.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Yea Zung Tobacco Co., Ltd., Shanghai.—Eight new brands of cigarettes besides two old brands, are being manufactured and marketed by the Yea Zing Tobacco Co.,Ltd. 114 Jun An Li, Rue Porte de L'Quest, Shanghai. The company is capitalized at $500,000 at $100 per share. It is equipped with 7 cigarette-manufacturing machines of French make. The manager is Wang Tai-su.

Motor Service between Tientsin and Paoti.—A motor-bus service between Tientsin and Paoti, a district in Chihli province, was started on November 1. It passes through three intervening stations, Meichang, Tsuihwang and Takowtun and takes four hours to complete. The charge for each passenger is $2.40 for one through trip, and $20 for a special car. Two regular services start from each end every day.

Vehicles in Hsuchow—Good roads are now being built in Tungshan, the first district of Hsuchowfu, Kiangsu province, and will be completed in the course of a few months, when carriages and motor cars will be introduced. At present, the city is not fit for modern vehicles. The streets are narrow and the pavements uneven, inconvenient even for ricsha pulling.

Ricshas were introduced into Hsuchow after the building of the Tientsin-Pukow Railway. They number at present over 300, being for public hire in the city or outside the city. The prevailing vehicles in the district are " ox-carts, and single-wheeled hand-carts. These were the only means of communications before the Republic, apart from horses and donkeys, and remains popular to this day. Ox-carts have four wheels, iron-tyred, and a wooden frame, or body, five *chih* in width and two *chih* above the ground, drawn by oxen or horses. These carts are very useful to farmers, being used to carry fertiliser, farm products, building stones, etc.

Farmers owning 10-20 *mow* of land usually have at least one, which, when not needed, is sometimes hired out to take building stones to the city. Single-wheeled handcarts have very big wheels, projecting above the frame, or body, thus dividing it into two parts, one on the right and the other on the left. These handcarts serve for the conveyance of passengers as well as goods, two passengers sitting one on each side of the frame. They are still used for country travel.

Hulan-Hailun Railway.—The Hulan-Hailun Railway, Heilungkiang province, was formally opened to traffic on January 23, Traffic on the railway is now open as far as Suihwa. Construction work on the line north of Suihwa has been delayed.

Long Distance Transportation Companies.—Shanghai is connected with a number of outports by light railways and motor buses, besides railway and steamship lines. There are two light railway companies, namely, the Shanghai-Nanwei Light Railway Company, Limited, and the Shanghai-Chuansha Light Railway Company, Limited. There are two motor bus companies, namely, the Shanghai-Taichong Motor Bus Company, Limited, and the Shanghai-Minghong-Cheling Motor Bus Company, Limited. The Shanghai Nanwei Light Railway Line originally operated motor buses, but in the spring of 1925 adopted the light railway system. The Shanghai-Chuansha line which had originally planned to run motor buses finally adopted in the fall of 1925 the light railway system, following the example of the Shanghai-Nanwei Light Railway Company.

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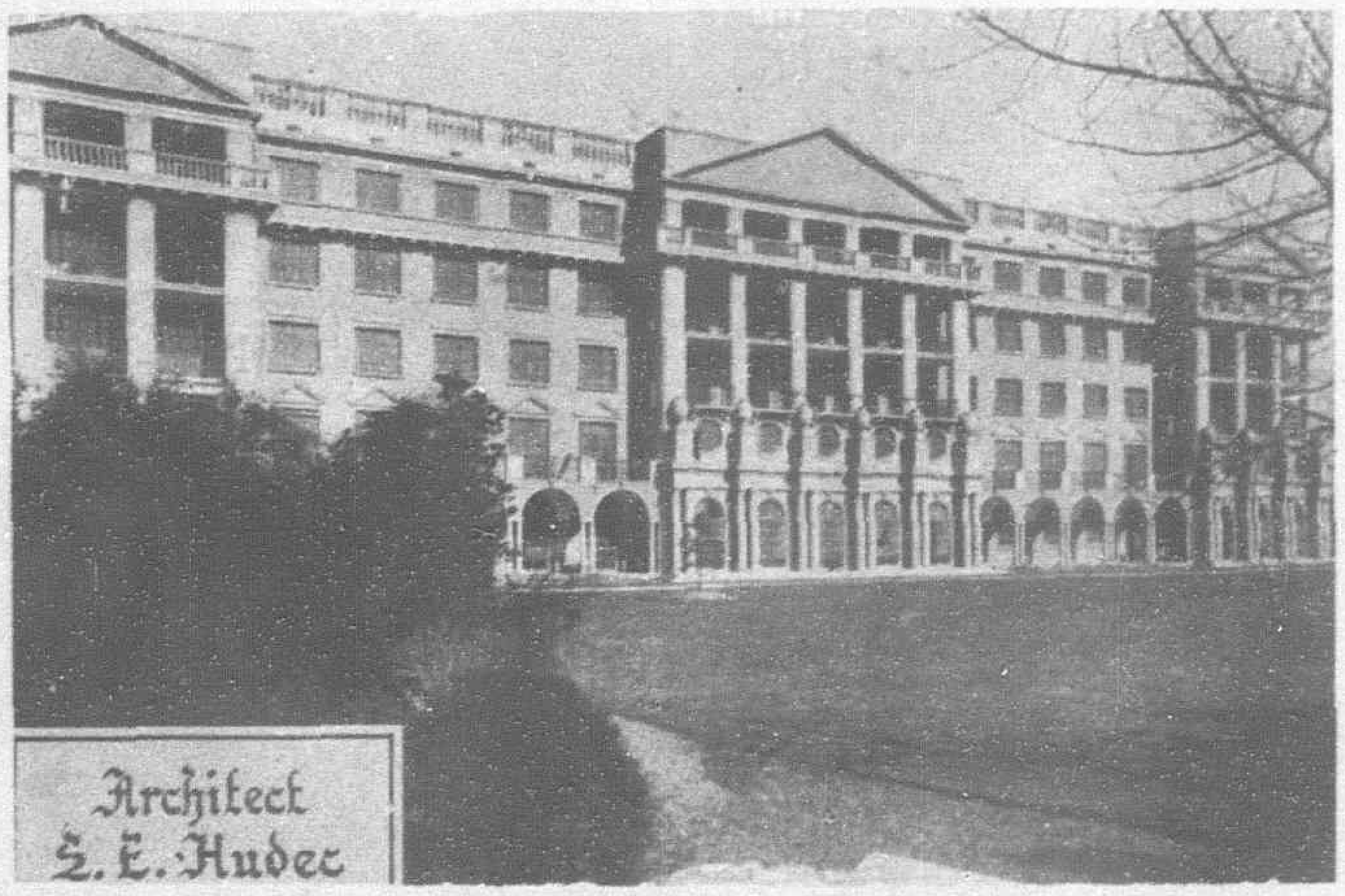

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